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Report on the re-arrangement
and development of the

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THE PRESSURE OF BUSINESS SOUTHWARD.

Looking North from 12th St.—At the right, La Salle St. Station; at the left, Grand Central Station, B. & O. bridge and retaining wall in 5th Avenue. Note the abrupt check of building development to the southward at the line of railroad occupancy.

REPORT

ON THE

RE-ARRANGEMENT AND DEVELOPMENT *of the* STEAM RAILROAD TERMINALS

OF THE

CITY OF CHICAGO

SUBMITTED TO THE

CITIZENS' TERMINAL PLAN COMMITTEE
OF CHICAGO

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CHICAGO, ILLINOIS

BY

BION J. ARNOLD
CONSULTING ENGINEER

Chicago, November 18, 1913.

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Table of contents, 3rd line: "Commission" should be "Committee."
Page 8, 5th line: "comapnies" should be "companies."
Page 9, 5th line: Omit comma after "were."
Page 10, 2nd paragraph, 3rd line: "larger" should be omitted.
Page 11, 9th line: "to" should be omitted.
Page 15, 4th paragraph, 3rd line: "Drummon" should be "Drummond."
Page 16, 16th line: Comma after "them" should be omitted.
Page 18, last line: "of" should be "and."
Page 24, 4th line from bottom: "or" should be "and."
Page 30, 10th line from bottom: "tnnnel" should be "tunnel."
Page 67, 3rd paragraph, 5th line: "car" should be "vehicle."
Page 68, 2nd line: "or" should be "of."
Page 69, 10th line: "not" should be "now."
Page 79, 9th line: "Northwestern" should be "north-western."
Page 103, 10th line: "freight" should be omitted.
Page 135, upper table: Heading of first two columns should be "Through Trains," last two columns "Suburban Trains."
Page 162, 12th line: "etsate" should be "estate."
Page 197, 5th line: "from" should be "for."

LETTER CREATING THE CITIZENS' TERMINAL PLAN COMMITTEE, ADDRESSED TO THE PUBLIC BY THE CITIZENS' COMMITTEE.

CHICAGO, August 18, 1913.

Although Chicago is the greatest railroad center in the world, there has never been a comprehensive study made by a duly qualified and authorized technical commission of its railroad passenger and freight terminal problem in its entirety. As this many sided problem is becoming more and more complicated, it seems to us imperative that such a study be made now, and by a commission of the ablest experts obtainable. We believe that such a broad investigation is needed to supplement the inquiry provided for by the present City Council Committee on Railway Terminals.

We are not committed in favor of or against any of the various terminal plans which have been recently proposed, and our only object is that this problem shall be thoroughly, broadly and constructively investigated, with a view to reaching the best general solution.

If such an investigation is to be made and its comprehensive and impartial character safe-guarded, we believe that

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under the circumstances this can best be carried out as a voluntary citizens' movement.

In recognition of these facts, a group of citizens have been engaged for several weeks in maturing plans for securing such an investigation by such a commission and securing the requisite funds therefor. It is believed that for this purpose a fund of one hundred thousand dollars should be provided. Over two-thirds of that amount has now been subscribed on condition that the balance be obtained.

With such an investigation in view the urgent matter for immediate consideration is obviously the proposals of the Pennsylvania Railroad Company and its associate companies for new passenger and freight terminals on the west side of the city. It is imperative that no plans be adopted for these improvements which would prevent or seriously interfere with carrying out the most desirable comprehensive solution of the terminal problem for Chicago as a whole.

As preliminary, therefore, to the exhaustive investigation and report of the commission, Mr. Bion J. Arnold has been engaged to make a study of the terminal proposals of the Pennsylvania and its associated companies, and of the terminal plans submitted respectively by Mr. Jarvis Hunt, by Mr. Charles H. Wacker and his official associates, by Messrs. Pond and Pond, by Messrs. Guenzel and Drummond, and any other plans which he deems valuable; likewise a study of the report, when made, of the city's expert, Mr. John F. Wallace,

whose recommendations are expected to receive early attention in the City Council.

Mr. Arnold is to outline in a general way what should be the principles of an adequate and comprehensive railway terminal plan for the city as a whole; to report as to the extent to which such plans as may be recommended by Mr. Wallace would or would not fit into such a terminal plan for the city as a whole; to report what if any modifications of the plans recommended by Mr. Wallace should be made, and why, and to deal with any other matter in his discretion. He is also to report as to the field which should be covered in the comprehensive investigation by the commission of the railroad terminal problem of Chicago. His report is to be submitted to the committee below as soon as practicable after Mr. Wallace's report is avaliable.

Messrs. Alfred L. Baker
Julius Rosenwald
Alfred Cowles
David R. Forgan
Morton D. Hull
A. A. Sprague, II
Charles S. Cutting
John W. Alvord and
Mrs. Emmons Blaine

have consented to act for the above purposes as a Citizens' Terminal Plan Committee, which will administer the funds contributed, receive the report of Mr. Arnold and take such steps as shall seem wise to give it publicity and effect, fill vacancies in or add to its membership, and take other action as it may see fit.

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The signing of this statement involves no financial obligation, the funds for the above work having been provided under separate agreement.

Alfred L. Baker
Julius Rosenwald
Alfred Cowles
David R. Forgan
Morton D. Hull
A. A. Sprague, II
Charles S. Cutting
John W. Alvord
Mrs. Emmons Blaine
Jane Addams
Benj. Carpenter
Edgar A. Bancroft
Francis Beidler
J. W. Loewenthal
James A. Patten
Wallace Heckman
S. W. Lamson
L. J. Lamson
August Gatzert
John F. Bass
Joseph Schaffner
Francis W. Parker
Samuel Dauchy
William C. Boyden
Eames MacVeagh
George E. Cole
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Tomaz F. Deuther
Henry B. Favill
Walter L. Fisher
Stephen T. Mather
Victor Elting
John Siman
Harriet Vittum
LaVerne W. Noyes
Lewis C. Walker
Frank I. Moulton
Arthur J. Mason
Mrs. Elizabeth Bass
H. McB. Johnston
J. L. Houghteling

MAIN REPORT.

Chicago, November 18, 1913.

Citizens' Terminal Plan Committee,
Chicago, Illinois.

GENTLEMEN:

Your Committee, on September 19, 1913, formally instructed me, by suitable resolution, to proceed with the investigation of the steam railroad terminal problem of Chicago in accordance with the conditions set forth in the letter of the Citizens' Committee to the public, dated August 18, 1913.

The sixty intervening days after the authorization of the work have been utilized to the best advantage by myself and a competent staff in studying the various plans and reports that have been published relating to this subject, and especially those referred to in the letter of the Citizens' Committee.

Mr. Wallace's report was delivered by him to the Committee on Railway Terminals of the Chicago City Council on October 18th, so that the time allotted to me for studying the other plans prior to the issuing of Mr. Wallace's report, and for the consideration of his report, has been very short for so important a subject. But, as your Committee and the Council Committee have deemed it important that my report be delivered at the earliest practicable date, I have completed it as rapidly as possible, and have the honor to submit it herewith.

At the outset, after being entrusted with this work, it was assumed by me essential, in order to avoid future misunderstandings and controversy over non-essentials, to co-operate with Mr. Wallace so far as practicable in collecting from the railroads statistical data upon which we might base our respective reports, in which arrangement he willingly concurred, and to this end duplicate data sheets were submitted by us to the railroads. It should be understood, however, that I have not confined myself exclusively to conclusions based upon these data, but have independently pursued such lines

of investigation as seemed to me necessary to answer the broader or fundamental questions referred to in the Citizens' Committee letter of August 18th, either directly stated or implied.

I desire to express my appreciation of the support of your Committee and of the co-operation of Mr. Wallace and his staff in the collection of statistical data, as well as to the officials of all of the steam railroad companies entering the city, who have unhesitatingly furnished me with such information as had previously been asked for by Mr. Wallace. This information, when properly compiled and analyzed, will be of great value in finally determining many of the questions referred to by Mr. Wallace in his report and discussed in this report. The time, however, since the receipt of this information has been too short to enable me to carry all of the studies based upon these data to final conclusions, but the information therein and such other as I have been able to compile from other sources, has enabled me to reach conclusions on the essentials which are treated in this report.

I also wish to thank the Chicago Plan Commission, the City Club, Messrs. Jarvis Hunt, Pond and Pond, Guenzel and Drummond, and the D. H. Burnham Company, whose valuable contributions to this subject are well known, and others who have furnished me with information and suggestions bearing upon the railroad terminal problem as well as to my own staff whose loyal and conscientious work has made it possible to produce this report within the stipulated time.

For the benefit of those who do not care to read the report in detail, I have thought best to herein set forth its salient points, freed from all technical and statistical matter.

Track Elevation Difficulties: When considering the physical difficulties that must be overcome in any re-arrangement of the steam railroad terminals, one is constantly confronted with the complicated situations caused by the elevation of many of the steam railroad tracks leading into the city, due to

the fact that they cross each other in many places, and are elevated in close proximity to the congested business center which we are trying to improve, and to the use of the stub terminal without through connections. I understand the policy of the Track Elevation Department of the city has been to keep all tracks up so far as practicable, and with this general policy I have no quarrel; for to have required the railroad companies to have depressed all tracks that have been elevated would have bankrupted them. The intention of the Track Elevation Department seems to have been, however, as indicated by one of the plans in Mr. Burnham's original report, to keep all tracks elevated west of the river and parallel to Canal street, and upon this theory presumably the Chicago & North Western Railway and the Soo Line have been allowed to build their new terminals. While the construction of the Soo freight terminal in its present location, extending only as far north as 12th street and occupying railroad property next to Canal street, especially adaptable for railway purposes, offers no serious objection, the construction of the North Western station, with its present elevation as far south as Madison street was an error that should have been prevented, and one which greatly complicates the situation at the present time. Had the city availed itself of its opportunity to conserve its own interests at the time this company came before it for a franchise, and required the company to keep its tracks below the surface south of Fulton street or else to elevate its tracks, no further south than Lake or Randolph streets, there would have been no so-called "Chinese wall" started along Canal street and the incentive to continue it would now be lacking. Had the policy of the depression of these tracks, as well as all others between Canal street and the river, then been adopted, there would have been created a depressed railroad highway parallel to the axis of the city which would offer no serious obstruction.

Passenger Terminal Development: Assuming that none

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of the present passenger terminals had been constructed, but with the city otherwise as it now is, the best practicable plan for passenger terminals for the City of Chicago, that could now be put into effect, on the assumption that all railroad comapnies would co-operate with the city in carrying it out, would be to have two main terminals, one located on the present site of the Illinois Central station at 12th street, and the other west of the river (and in this principle Mr. Wallace and I concur), with these stations supplemented by other smaller stations to the north and south for suburban traffic.

Owing to the fact that it has already been decided to construct a viaduct on 12th street, these stations, if both were located at 12th street, could be of practically the same design, viz.: through tracks on the low level, and stub tracks on the upper level, the latter abutting on the elevated viaduct of 12th street. With this design it would be possible to build stations with the requisite number of tracks to take care of the business of all of the roads for probably 30 years, and with sufficient space left to expand them into stations having about 40 tracks on each level, which would take care of the main line through passenger business for almost an unlimited period. When the capacity of these stations was reached the additional suburban stations to the southward and northward could be extended as the business district expanded, and all of these stations so connected that through trains could be run from station to station, and thus make possible such divisional use of these stations as might at that time seem best, somewhat on the original Burnham and the Guenzel & Drummond plans. This arrangement would eliminate completely all terminals now obstructing the expansion of the business district southward, and parallel this central district on each side with railroad transportation to the maximum extent necessary, and at the same time locate one of the main stations on the west side

of the city, which the geographical location of many of the roads demand.

It is assumed that the Illinois Central Company will construct a station similar to the one I have described, on its present site at 12th street. A similar station, if it were, to be constructed at 12th and Canal streets, could be planned upon either one of two assumptions:

1. That the river will remain as it is and that a bridge of suitable size, similar to that now used by the Pennsylvania Company on Stewart avenue, would continue to be used on the approach tracks leading to this station.
2. On the assumption that a wide entrance to the drainage canal will be cut through from the lake to the river, at some point in the vicinity of 24th street, thus making it almost imperative that all railroads and streets entering the city from the south pass through tunnels under this canal, or straightened river.

Assuming that bridges will continue to be used by the railroad companies, such a station could be so constructed on two levels at 12th street, that the lower level could be made a complete through station for the use of the Pennsylvania, the Chicago & Western Indiana, the Rock Island and Lake Shore Systems from the south, and the Chicago, Milwaukee & St. Paul, Chicago & North Western, the Soo Line and other roads from the north. This would leave the upper deck for the use of the Chicago, Burlington & Quincy and the Chicago Great Western Railroads, and possibly the Illinois Central lines from the west, or the Soo Line, if it chooses to enter this station, from the south.

In case the tunnel approach was used, the station could be so constructed that the lower level would be partially or wholly depressed below the present surface, thus enabling the tracks to be kept down after passing underneath the river, making the entrance gradients much easier than in the former case, for through train operation, although such a tunnel en-

trance from the south would necessarily close some streets south of the river in order to allow the grade to descend from the present elevated tracks to the tunnel level. The tracks of the upper deck would then either be carried through under the 12th street viaduct to the northward, thus making a complete double deck, double end through station, or stopped at the 12th street viaduct, and the same arrangement as before adopted, or such other arrangement for the utilization of the tracks by various roads as might seem best. If the Illinois Central were granted additional land so that its terminal could extend farther into the lake and the west side terminal located at some point north of 12th street and south of Harrison street neither terminal need be double-decked but could then be a single-decked, straight-away, pull through station.

Into this west side station could be run all roads coming from the southwest, west and northwest, upon which roads could also ultimately be established additional outlying larger stations in the same manner that similar stations were established on the north and south roads. The general effect of the outer steam railroad facilities of the city would then tend to enlarge the business district of the city equally in all directions.

Inasmuch as the Illinois Central station is already located upon a right-of-way dedicated to railway purposes, not crossed by streets, and the property west of the river, upon which the other through station would be located, is already low, we have two railroad highways already created, which if depressed to a level just above city datum and utilized in the manner herein suggested would give as near ideal conditions as possible for railway passenger terminals, with maximum convenience and with as little obstruction as could be hoped for in a level city, having a rectangular street plan, in connection with the complications introduced by the present location of the Chicago River.

Suburban Through-routing: In the proper utilization

of such an arrangement all of the roads entering the city from the east and south should naturally use the Illinois Central station, while all of those entering from the southwest, west, northwest and north, should naturally use the new station west of the river, unless a connection should be made by means of a tunnel (see page 192) whereby the roads from the northwest, such as the Chicago, Milwaukee & St. Paul and the Chicago & North Western, could to be carried eastward under some east and west street, probably Ontario street, and made to connect through a tunnel under the river with the Illinois Central Railroad tracks south of Randolph street, thus bringing some of the suburban trains of these roads into the Illinois Central station, while other suburban trains from these roads would run through the west side station to the south and southwest over the tracks of the Pennsylvania and other roads, thereby creating an ideal intramural and interurban system of transportation by means of the through-routing features of these stations, and the proper interconnecting of the various railroads of the city, as fully discussed in Section 10.

With such an arrangement, supplemented as hereinafter stated, the present business district would, instead of being blocked by railroad terminals in three directions, as at present, be, as previously stated, paralleled on either side with an efficient and convenient through-routed suburban service, tending to lengthen and spread this district.

By means of this through-connection between the stations, through passengers could easily transfer between the stations. But should it be deemed advisable by the railroad companies to so group their roads that eastern and western roads could be connected together in the same station, and thus make convenient the transfer of passengers between certain eastern and western roads, this could easily be accomplished in many instances, without grade crossings or track elevation, by exchanging the use of tracks now running parallel

for some miles on the same grade. Such, for instance, as the tracks of the Pennsylvania lines and the Chicago & Western Indiana between 21st and 45th streets.

By the same principle of through-routing and connections between main stations, sleeping cars and trains of different roads could, if desirable, be routed through Chicago.

In justification of my recommendation in this respect I perhaps may be excused for calling attention to the fact that in my 1902 report to the Chicago City Council, upon the local traction situation, then in a chaotic condition, I recommended the adoption of universal through routing for the surface street railway lines of the city, the principles of which were embodied in the 1907 ordinances and that after 11 years of persistent effort on the part of the public, these principles have been accepted and adopted by the companies, as evidenced by the recent unification ordinance passed by the Chicago City Council on November 13th. In like manner, my report to the City Council of 1906 advocated the through routing of the trains of the elevated roads of the city, the benefits of which method of operation were achieved on November 1st, and in both instances under conditions that will be profitable to the companies. Both recommendations were considered impracticable at the time they were made and strenuously opposed by the operating companies, but time and a persistent effort on the part of those who believed in them have proven the recommendations correct, and in like manner I believe that the recommendations herein made with reference to the through routing of the steam railway suburban, if not the through, service will in time prevail.

Type and Number of Stations: My studies of the various plans submitted and a fairly intimate knowledge of Chicago's local needs, have caused me to conclude that the above principles would be correct for the steam railroad terminal system of Chicago if they could be carried into effect, and I have arrived at the conclusions in

this report regarding the merits of the respective plans submitted to me for consideration by subjecting all of them to a uniform analysis as regards type, method of operation and capacity, their adaptability to the above plan, as well as their general convenience and desirability from the standpoint of the public. This method of analysis will be found fully set forth in Sections 3, 7 and 8, entitled "Growth and Future Development," "Capacity and Efficiency of Operation" and "Analysis of Terminal Plans Presented."

In these studies the law of probable growth of traffic was determined and it was found that if Chicago maintains the same rate of growth in railroad business as the entire country, within a given period the passenger train movement of Chicago and vicinity is likely to increase as the square of the population of the entire country within the same period, *i. e.*, if the population doubles the train movement would quadruple. In the same manner it was found that the passenger traffic will likely increase as the cube of the population of the entire country and applying this measure to the different plans proposed, the remaining life of the present terminals was determined collectively, and likewise the probable life of a single passenger terminal designed to accommodate the passenger traffic of the entire city.

For example: Considering a single union passenger station on the lake front, having 29 stub tracks on two levels, with suitable through connecting tracks, such as the Illinois Central Company's right-of-way at 12th street would permit, by the above method, it has been calculated that such a station would take care of the entire passenger traffic of the City of Chicago, including all the suburban business of the city, for about 7 years, and that, if the suburban business were eliminated from this station, it would take care of all of the main line through traffic of the city for about 28 years. And further that if a similar new station of about the same capacity were constructed at some other point these two stations would take

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care of the combined passenger traffic of the city for about 32 years, and of the main line through traffic exclusive of suburban for about 50 years. On the assumption that the Chicago & North Western station would take care of its own traffic, these two stations would accommodate all of the through and suburban traffic of the city, except the North Western, for about 42 years, and all through traffic, except suburban traffic, for about 55 years.

Considering another phase of the subject, dealing more specifically with type, method of operation and number of stations, from the capacity studies it was found that a single berth through station or a double stub end station had the greatest capacity for a given investment, provided it was properly located so as to be easily accessible and so designed as to be able to utilize the tracks at each end upon the reservoir principle, *i. e.*, when the outbound traffic was heaviest as is usually the case in the evening hours, most of the tracks could be used for outgoing trains, while the reverse takes place in the morning, and this is accomplished in a stub-end or a straight-away through station, by having all of the tracks converge into two, or more lead tracks, thus making it possible for all of the tracks to be interchanged between inbound and outbound traffic, according to the demands of this traffic at various times of the day. This principle does not hold with a station divided into separate parts, *i. e.*, one having exclusively inbound and the other exclusively outbound tracks. Furthermore, it was found that a given number of stub or through tracks located in one station would handle more traffic than the same number of tracks located in several stations, due to the fact that there must be in any station a certain margin of reserve tracks; but this margin could be proportionately less as the size of the station increases and the number of stations decrease. This does, however, emphasize the correctness of the principle accepted by Jarvis Hunt and others, that a single station would be the most economical to construct

and operate; consequently the number of stations should be kept as few as practicable.

Unfortunately, however, the Hunt plan, ingenious and comprehensive as it is, did not possess this interchange or reservoir principle, and was so located as to constitute an obstruction to the extension of the business district; furthermore for these as well as for other reasons set forth in Section 8, wherein the various types of stations are analyzed, it did not seem to me as well suited to the situation as a plan involving two or more stations, especially in view of the fact that it would require changing the location of every passenger station and many of the principal freight stations in the city, which while advantageous in many cases did not seem necessary in all cases.

Were it deemed advisable to adopt a single station for the City of Chicago, it would seem to me that its logical location would be upon the terminal property of the Illinois Central Railroad at 12th street, where no streets would be obstructed and where ample capacity to the eastward could be obtained for the enlargement of such a station. But it was thought that the practical difficulties in the way of getting all of the railroads to agree to occupy this station, if it were advocated, and especially those from the west side of the river, most of which logically belong west of the river, coming as they do from western territory, would make this plan impracticable.

Similarly, the plan of locating in one particular locality, unit stations as advocated by Messrs. Pond & Pond and Guenzel & Drummon, meritorious as these plans are in many respects, automatically becomes impracticable, for the same reason, viz: that there is a logical and natural division between the different railroads of the city, as determined by their geographical location and the serious practical obstructions caused by the Chicago river. For these reasons, and from the fact that the new North Western station is already located, and will undoubtedly be used for many years to come, and the fact that the Illinois Central company has such a de-

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sirable location for a station, and probably could not be induced to leave it (for there is no good reason, from a railroad standpoint and little from the public standpoint, upon which to advocate its removal, if the Illinois Central company properly improves its right-of-way), I was forced to the conclusion that any plan contemplating less than three stations now, with the possibility of more later, would be impracticable at the present time for Chicago, and that, therefore, suitable provision could and should be made for the construction of the new passenger terminal station now contemplated by the Pennsylvania Railroad and its associates. The question, therefore, of the location of such a station is the important one, and it seemed to me best, all things considered, to revert to the fundamental idea set forth by Mr. Burnham in his "Plan of Chicago" issued by the Commercial Club in 1909, wherein he recommended that unit stations, certain of them, located along Canal street, be adopted for the future railroad passenger terminals of the city, using either elevated or depressed tracks. My recommendations, however, are *not alternative* but are *absolutely for depressed* tracks in this particular locality, for such stations can be located upon the low land contiguous to the river, which forms a natural location for railroad terminals, and which is now almost exclusively occupied for this purpose.

Location of Stations: Conforming to this idea, the question narrows to one of where, within this district, should the new Pennsylvania passenger station be located to best serve the interests of the citizens of Chicago and the railroad companies building it?

In Section 11, entitled "Passenger Terminal Modifications" it is shown that the location of a passenger terminal for the Pennsylvania Company and its associated roads on Canal street, south of 12th street, is not impracticable, and if this company would now see fit to locate at this point, the previously described plan could be at once adopted, and the solution of the passenger terminal problem of the city would be

much simplified, because all the other railroads, with the exception of the Chicago & North Western, could then probably be easily induced to finally locate in the new Illinois Central station on the lake front, or with the Pennsylvania Railroad company in its 12th street location, and thus make it unnecessary, to ever construct any more passenger stations in the business district between Michigan avenue and the river. But, in my judgment, such a location would be unfair to force upon the Pennsylvania Railroad company unless other competitive roads and those other roads now having passenger stations north of 12th street, agree to join it in a new station or enter the Illinois Central station, for the reasons that such enforcement, would compel the Pennsylvania company to give up its present advantageous location and recede to a point the most distantly located from the business center of all the roads, and be still further handicapped by not only having to cross the river, but also be located in a district now inaccessible.

Furthermore, it is not at all clear to me that the business interests of the city would now be served best if the Pennsylvania and its associated companies now moved their station south to 12th street, as this location would unnecessarily inconvenience the many patrons of the present Pennsylvania terminal for some years, with little or no advantage to be gained during the years that it would take to build up the territory between Harrison street and 12th street so as to make the 12th street site a desirable location.

For these reasons it seems to me that if the Pennsylvania Company would agree to locate its passenger station with the headhouse just south of Harrison street, that its interests would be fully conserved, as this location would make its accessibility to the present business district no more advantageous than a 12th street location of the other roads would be should they move back, due to the ease with which this 12th street location could be reached (if 12th street and Canal street are boulevarded) as compared with the hardship of being com-

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pelled to cross the river to reach the Harrison street site, something that many of the patrons of the Pennsylvania Company must now do and continue to do so long as its station is west of the river. By thus moving back the company would not only get space desirable for the expansion of its passenger station, but would also at the same time be making a concession to the other railroads, which ought to result in their co-operation toward carrying out a terminal plan that should in the end prove satisfactory to the city. This location would not only fit the principle of the preferred plan previously described, but also be sufficiently close to the business district to make it easily accessible, provided the streets were properly improved by the city. It at the same time would locate the center of the station upon one of the principal subway systems projected for the city by all parties who have heretofore studied this question and made official recommendations for a subway system, which advantage will probably not be available to the Pennsylvania terminal patrons if the station is located on Adams street, as its ordinance now pending before the Council Committee contemplates.

If the Pennsylvania Company will not now make this concession to the other roads, and insists upon building at Adams street, it should be required, if allowed to build now, to confine itself to the construction of a station adapted to the location, without cramping the river, which could be used by itself and its associates for some years, and at the same time agree that when the capacity of this station is reached, and at any event within a fixed period of years, unless some method of through routing of main line trains shall have been adopted, to abandon the use of this station for its main line through passenger trains and recede to a new terminal at 12th street, west of the river, if it so elects, or, preferably, east of the straightened river, as shown in Fig. 42, thus avoiding crossing the river at all; *provided,* a co-operative agreement has been reached between the different railroad companies of the

city for straightening the river, wherein all roads not naturally belonging west of the river, agreed to recede from the present business district and use either the Illinois Central station, or the new station above suggested, and failing in this, place their passenger stations south of 12th street. The Pennsylvania station thus released could then be used exclusively by the Burlington, the Chicago, Milwaukee & St. Paul, the Soo line, the Chicago Great Western, and possibly the western division of the Illinois Central,—all being roads coming from the west, whose logical location for a station is on the west side of the river.

Inasmuch as it will undoubtedly take considerable time to bring about proper co-operation between the railroads for the adoption of any co-operative plan, the city must soon decide whether it is wiser to refuse to grant any rights to the railway companies for improving the terminal facilities until such negotiations culminate, or decide just what improvements it will now authorize.

In order to meet this situation and also to answer the question asked by your committee as to how "such plans as may be recommended by Mr. Wallace would or would not fit into such a terminal plan for the city as a whole" as I might recommend, I can state that if the Adams street plan, as recommended by Mr. Wallace, is now adopted provided the fundamental conditions herein recommended (as set forth on pages 41 to 45) are agreed to, it will not necessarily prohibit the future development of other stations between Canal street and the river south of Adams street on the preferred plan (page 178), *i. e.,* both union stations at 12th street, or on the *co-operative unit* principle (see Fig. 34, page 174), in general accordance with the Guenzel and Drummond and Pond and Pond idea. And further if this co-operative unit plan fails entirely of adoption there still remains the opportunity for the development of *individual stations* along Canal street and south of 12th street. (See Fig. 42, page 184.) In the latter

case the most logical solution for the Pennsylvania Company, if it decides to recede with its main terminal, and such other companies as do not arrange to occupy the 12th street station of the Illinois Central Railroad Company, would be for them to build eventually, one or more terminal stations east of the straightened river, and south of 12th street (See Fig. 42, page 184), either in accordance with the later Delano unit plan, the Jarvis Hunt plan, or that of the executive officers and engineers of the Chicago Plan Commission, or such particular design of station or stations as may seem best at the time, the only fundamental requirements to be that the tracks shall be either overhead or underground, or both, in order to keep the surface free from tracks and the surface of the streets clear of obstructions and as open to light and air above as practicable.

In case the above plan, involving the use of stub stations or other terminals which would stop all through passenger trains at 12th street, should be adopted, there would then be no good reason why the present La Salle street station should not be retained in service and utilized as the suburban terminal of such eastern, southern and southwestern roads as use these 12th street terminals for through passenger trains, provided the tracks leading to the La Salle street station were placed under ground and covered north of 12th street. It would also be possible to extend two tracks northward under La Salle street, separating around the Board of Trade building, thence through the present La Salle street tunnel to a connection with the east and west subway on Ontario street hereinbefore referred to; thus providing high speed suburban service directly through the center of the entire business district; for by the construction of a subway on Clark street for street railway cars, the use of the La Salle street tunnel, which is owned by the city, could be abandoned for street railways and used as previously mentioned. (See Fig. 44, page 192.)

The La Salle street station, being almost in the exact center of the business district bounded by 12th street and the

river, and located upon the loop of the elevated roads, would make an ideal suburban railroad terminal not only for the people but for the companies, and could be developed into a commercial and office building similar to the Hudson Terminal in New York City. Thus the property of those companies most likely to object to moving their terminals back to 12th street (if the Pennsylvania Company is allowed to remain at Adams street), would be able to utilize their present property advantageously and efficiently, and at the same time extend to the other roads, who joined them in locating at 12th street, or entered other 12th street stations contiguous to it, better suburban terminal facilities, not only for themselves but for their patrons, than they now have.

Again, while I believe that the Harrison street location would be better for the railroads and the city, I am not so sure that the retention of the present Adams street site by the Union Station Company, and the grouping of its terminal with that of the North Western Railway, approached from the east by an opened and possibly widened Monroe street (from La Salle street, west), would prove a detriment, or in reality result in a deterring factor in preventing the other roads from finally voluntarily receding from the business district, for this arrangement would in effect be placing one of the main terminals referred to in my preferred plan at this location though divided into two small terminals. Furthermore, the development of the business district southward, will in time make the 12th street location, if Canal street and 12th street are widened and boulevarded, so desirable a location for the other roads that they may not consider that the Pennsylvania Company then has the advantageous location with reference to the business district that it now seems to have.

Thus, in case of absolute failure on the part of the city to get the roads to co-operate in the construction of union terminals, these roads now having terminals in the center of the business district may, for their own

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protection, as they need additional passenger facilities, either join the other roads as previously outlined, or construct new terminals south of 12th street, for none of these terminals is so located as to warrant reconstruction upon its present site, except for suburban or freight business, the probability of which is treated elsewhere.

As examples there may be cited the recession of over a mile by the Illinois Central Railroad Company of its main passenger station from Randolph street to 12th street, and that of the New York Central Railroad of its terminal from its original down town location to its present Grand Central terminal at 42d street, New York.

By this method of reasoning and bearing in mind the fact that the Union Station as designed by the companies' architects, with a few slight changes, is, according to the statements of these architects easily converted into a straight-away, pull-through station (though of much smaller capacity than could be built at Harrison street) and looking at the subject from the most pessimistic viewpoint of the public, there should be no serious objection or opposition to allowing the Pennsylvania and associated companies to build their passenger terminal at Adams street; *provided,* that the ordinance authorizing its construction carries with it no rights to construct freight terminals and that these companies are bound by contract ordinances with the city to carry out the suggestions with reference to a relocation of the terminal as stipulated on page 18, the widening and boulevarding of Canal street, in general accordance with the recommendations herein made relating to the provision of a marginal way along the river, the equalization of viaducts at street levels, as set forth in Sections 2 and 11, and other recommendations hereinafter made; and *provided further,* that they agree in said ordinance to co-operate in the straightening of the river, so that when straightened it will be located approximately as shown on Plates I,

II-A or II-B, depending upon the location that may be finally determined upon by competent authority representing the railroad companies and the city; and *provided still further,* that it pays the city in cash, or in improvements which the city would have to make in carrying out the terminal plan herein recommended or such other plan as may be finally decided upon, a value equivalent to the value of the property vacated.

Straightening the River: The most important improvement that probably could be made for the benefit of not only the City of Chicago, but also the railroads themselves, would be the straightening of the Chicago river from either Harrison or Van Buren street due south. By this change, drastic as it may seem, the entire congested district south of the present business district, and now occupied by railroad terminals, could be opened up and the freight terminals of the railroad companies rearranged in such a manner as to not only greatly improve conditions for handling freight, but it would also in time make possible the construction of business blocks upon the sites of the present railway terminals, with the advantages of railroad terminal facilities underneath somewhat on the principle of those now underlying the large district north of the Grand Central Terminal Station in New York City.

While this class of improvement practically necessitates the electrification of the tracks, the suggestion is not made with the intention of attempting to force such electrification, as most all progressive steam railroad men now recognize that electrification of terminals must come within a reasonable time, and for the further reason that this subject is now being analyzed, at the expense of the railroads, by the Committee on Smoke Abatement and Electrification of the Chicago Association of Commerce, whose report is promised for the near future, but only for the purpose of emphasizing the advantages that the railroad companies now possess for future development by the ownership of these sites, which development can

ultimately be made, if properly done, without jeopardizing the interests of contiguous private property owners or the interests of the City of Chicago as a whole.

Furthermore, the straightening of the river would transfer from the west to the east side of the river, many acres of comparatively cheap property now lying west of the river, and by this change cause it to double or possibly treble in value, if it were properly developed, for it would then become a part of one of the most desirable localities of the business district. This increase is shown in Section 2 to be from $7,750,000 to $31,290,000, depending upon the location assumed for straightening the river and the relative increase of values assumed. Thus the expense of changing the river would not only be more than fully realized by the railroad companies who now own practically all of the abutting property on both sides of the river, as far as it is herein recommended to be changed, but they would also profit greatly by the change. Again, I am credibly informed that it is not improbable that the railroad companies could be induced to straighten the river without expense to the city, and thus enable the city to secure the much needed opening up of many of its north and south and east and west thoroughfares now blocked by railroad property and the tortuous passage of the river. From my investigation I am of the opinion that the cost of changing the river, as hereinafter recommended, can easily be met by the increased value realized from the change, and whatever this amount is, it might better be spent by the railroad companies in such an improvement than in the construction of monumental terminal buildings at needless expense which are used for terminals only, thus unnecessarily increasing the fixed charges of the roads to the detriment of the railroads themselves or to the traffic paying public. No other change could possibly be made in the reconstruction of the City of Chicago that would redound more greatly to its credit, and at the same time more greatly improve its business facilities and add to

the comfort and convenience of a larger number of its citizens, than the straightening of this river, for it would not only open up the business district to the south, but would make the business center easily and quickly accessible to the great mass of citizens living to the south and west.

Freight Terminal Development: With the river thus straightened, it would be possible to so develop and re-arrange the territory both east and west of the river, that the freight capacity and facilities of the railroad companies would be greatly increased, and thus make it possible to handle all the freight business that it is necessary to bring into and take from the business district of the city for many years, so that there would be no occasion now or in the far distant future for the acquirement of additional property for freight facilities in this district. As the business district extends southward these additional freight facilities would be more centrally located than they now are, thus better serving the extended business district as a whole than though this freight were concentrated in the present business district.

The studies I have made, as embodied in the plans herein presented, Plates I to III, have developed the following facts:

1. The freight facilities removed from the Pennsylvania area by the establishment of the new passenger terminal can more than be replaced in any one of the studies I have suggested, entirely within the freight area extending southward, by means of modern freight house construction.
2. In Plates II-A and II-B there is shown a preferred relocation of the river, and the facilities provided for the western roads, including the Pennsylvania, are about double those now available.
3. Even the minimum space provided, as shown in Plate III, yields more freight house facilities than those now in use by the Burlington and the Alton plus those of the proposed Pennsylvania development; also, assuming reasonably efficient use of the new areas, more team track facilities than at present required.

From every standpoint, whether the river is straightened

or not, the available areas can be developed to such an extent as to make it unnecessary for the Pennsylvania company to develop the proposed new freight area in the manner set forth in its plans. And there is also ample space available for all the freight facilities needed by all of the companies, if they will pool their issues and develop the territory as thoroughly as it is capable of being developed, by using modern and efficient methods.

Since the Union Station group of roads has been able to co-operate upon a union passenger terminal, I can see no valid reason why the same roads should not also be able to co-operate among themselves and the other roads concerned, upon a method for developing their freight facilities.

Finally, since the railroad companies have acquired and continue to acquire additional real estate in the congested business district of Chicago lying north of 12th street, east of Halsted street, and south of Chicago avenue, they should be required to place all tracks in covered subways and cover their property occupied by these tracks by the construction of modern storage houses, or business blocks which will earn a revenue in addition to that earned by the freight facilities.

As most of these affiliated roads in the Union Station company are on record as having declared for a large increase in freight facilities in this territory, it seems a reasonable presumption and no hardship that they should be required by the city to utilize, or at least agree upon a plan for utilizing the area west of the river (as it now exists, or as hereafter modified by the straightening of the river) to the best possible advantage before asking rights to occupy additional territory, and that the fair treatment of the city involves the co-operation with it in working out the freight problem on broad lines, so that if it is then made clear that additional freight facilities are actually needed, they can be properly developed, in accordance with well worked out plans and the proper rights

acquired from the city to consummate these plans. In fact all my studies contemplated the possible future use of property in the blocks west of the river contiguous to Canal street, as properly available for freight connections if developed along proper and effectual lines for the protection of the public interest and the modern and most efficient use of the property, both underneath and overhead.

Therefore, it seems to me that the problem immediately before the City of Chicago is not confined to the Pennsylvania terminals, but that before a single step is taken with reference to freight terminals, the plans of the affiliated companies,—the Chicago, Burlington & Quincy, the Chicago & Alton, and the Chicago, Milwaukee & St. Paul, should be asked for, so that franchises, immediate or prospective, for all of them can be simultaneously considered by the City Council. There is nothing impracticable about this method of procedure for such property as is already acquired.

Freight Organization: The freight business of Chicago can be divided into two general kinds: (a) that known as through freight, and (b) that known as Chicago destination or origin. And this division can be applied to both carload (C. L.) and less than carload (L. C. L.) or package freight.

Inbound freight trains now arrive at the various break-up yards located near the city limits where the cars are distributed, and practically one-half (See Fig. 6) of the total inbound freight of the city is sent to connecting lines for forwarding to other points beyond the city, and about 70 per cent. of the half interchanged, or 35 per cent. of the whole, is brought into the downtown district and switched between the various lines, the remaining 30 per cent. of the half interchanged being handled by belt lines outside of the city. Thus about one-half the freight is for Chicago delivery, a large part of which comes into the downtown district to be unloaded and distributed largely from the individual freight houses, or team tracks, of the companies, where

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those companies only deliver and receive freight for their own companies.

On first thought it would seem that there should not be so many individual freight houses, and that the complete adoption of universal freight houses (*i. e.,* freight houses where freight would be received for all roads and delivered from all roads) would be ideal, but on closer analysis this as yet seems to me to be impracticable and undesirable. There is no doubt but that the strong competition between the roads has resulted in the individual freight house idea having been carried to the extreme, but so long as individual road operation is carried on in the city there should be individual operation of freight houses to a certain degree. My analyses of this subject, so far as I have been able to conduct them in the limited time, are set forth under Sections 5 and 12, and my conclusions are, that there should be at least one universal freight house in each main division of the city surrounding the down town business district, and possibly more, but that this is one of the subjects that should require further study, at least on my part, before I could arrive at a definite conclusion.

Summarizing the present situation as regards carload lot freight, there will be established shortly by 12 of the roads interested, an effective method of handling interchange between all roads, an improvement which has long been sought for in Chicago. There remain 11 other roads, most of which are interested in the middle belt line; but at the present time there seems to be no operating connection between these two belt line systems, although a physical connection exists at Clearing, and additional facilities, if fully used in a spirit of cooperation upon the Clearing plan, would completely relieve the congestion of the inner city, so far as carload lot interchange freight is concerned. As the city expands there will

unquestionably come a time when both belt lines will be required to fulfill the functions of this Clearing plan, so that one of the principal needs for future investigation is the bringing about of the universal interchange clearing yard or yards for all the roads entering the city, at one or more locations as future business may warrant.

Referring now to less than carload lots (L. C. L.) freight, the three fundamental things which seem to me to require attention from the various railroads doing business in the down town district are as follows:

1st. The elimination of L. C. L. interchange freight now handled at the various terminal freight houses.

2. The provision of better shipping facilities, especially for small shippers.

3. The improved and more economical use of the freight terminal area now occupied in the down town district.

4. The development of a more economical means of transfer and distribution of city delivery L. C. L. freight than is now in effect, viz: by means of the perfection and utilization of the present Chicago Tunnel company system of collecting and delivering freight, and also a system of package freight lighterage operated between delivery points on the river and some universal clearing yard.

Following the same line of analysis previously described for freight entering Chicago, it is found that about 60 per cent. of the total package freight is interchanged between railroads, either by cars, tunnel or teams, the last named being entirely across the streets of the business district. Thus 52 per cent. of the transfer L. C. L. freight is teamed across the business district, as shown in Fig. 8. The remaining 40 per cent. of L. C. L. freight inbound is entirely for Chicago delivery at the inbound terminal freight house in the down town district.

In order to carry out this elimination of the interchange it seems evident to me that some clearing plan must be put into

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effect similar to that previously described for handling C. L. business, but just what plan is best or at what location such clearing yard or yards should be, I have been unable to ascertain, within the time at my disposal. This is one of the collateral subjects covered by the questions asked of me by your Committee which in my judgment should be further studied.

Chicago Freight Tunnel: In considering this question, however, as well as the best methods of handling package freight in the down town district I have made a special effort to find the logical field of usefulness of the Chicago Tunnel, 60 miles of which have been constructed at great expense in the streets of Chicago as an auxiliary distributing system, as discussed in Section 5. One of the principal objects of constructing this tunnel was to perform the function of freight connection and distribution throughout this congested area of freight terminals, and thus relieve to a large degree the congestion upon the city streets. Owing to a series of vicissitudes which it is not necessary for me to review here, and the control of this enterprise being held in such a manner that it has not been fully developed, this enterprise is not performing the functions for which it was intended. In the establishment of a clearing yard for L. C. L. freight a certain portion of the tunnel's legitimate business will be taken away from it unless a rail connection, either the car lighterage system, a river lighterage system, or a physical connection with the tunnel, as discussed in Section 5 is made between it and the clearing yards. The Chicago Tunnel ought to form a most useful vehicle for package freight handled in the business district, and it is a much more logical railroad freight terminal system than the present system of down town freight houses operating under intensely congested conditions of team delivery. Furthermore, the terminal charge can be borne by the shipper and reasonably be considered to take the place of the cost of team delivery; whereas the absorption of the terminal charge seems to be a matter of privilege expected by

the large shipper, which concession the railroad companies fear they cannot give to Chicago without granting store door delivery in all other large cities or be accused by the Government of discrimination in favor of Chicago merchants.

Insufficient Use of Present Freight Facilities: The fact stands out prominently that some of the roads handle from three to four times as much freight daily with a given area as others having the same type of freight terminal development, viz: single story freight houses and team tracks. One of the roads in the down town district requires only 53 square feet per ton of freight handled per day, in its inbound house, while another in the same locality requires 292 square feet. A study of table 14 will show that the house tracks in the freight terminals located in the congested portion of the city east of the river are utilized to much better advantage than are the house facilities of the terminals west of the river. There is no justification for freight terminals developed upon a plan which causes single deck freight houses to be built on property worth from $5 to $40 per square foot, resulting in a fixed charge in some cases as high as $2 per ton of freight handled. A discrepancy almost as great appears in the relative utilization of the areas assigned to team tracks.

Another influence largely affecting the efficient use of freight area is the delay in delivery of shipments, which the railroads cannot avoid. From the best information I can get, it takes an average of not less than 10 days to get a car through the Chicago district unloaded and reloaded, from the time it enters until the day it leaves for an outbound point. Prior to the large raise in demurrage charge, the average car was held 3½ days after setting. Since the raise in demurrage charge, in order to reduce this time, the average appears to be about 2½ days, as shown by demurrage curve Figure 13. Thus the railroads have partially done their part in endeavoring to utilize the freight facilities to better advantage, but there still remains the fact that in both house and team track areas a very large improvement could be made as shown by

the fact that some roads handle their freight much more efficiently than others.

A factor preventing the most efficient use of freight house facilities, is the prevailing practice of shippers in delaying their deliveries to the freight houses until late in the afternoon of each day, which not only congests the freight houses, but also the city streets at the same time that the same streets are congested by pedestrians and street car traffic during the evening rush hour. The net result of this is that not only is the freight often inefficiently handled, but the teams are also so delayed in making their deliveries that their efficiency is greatly cut down, and the expense of transfering freight from the business houses to the freight houses is thereby greatly increased.

Reviewing this present situation, the most useful improvement that can be made is the construction of such a type of freight house as will permit for the same track capacity a much greater area of street or roadway to permit easier access to the stations. This plan has been developed in the studies herein presented shown in Plates I to III for passenger terminal modifications between Canal street and the river; and in connection with a system of elevated viaducts co-ordinated in levels with the present and proposed bridges; also the double-decking of Canal street through this freight area in such a manner that freight houses located on Canal street will be easily accessible from both levels. All freight houses between Canal street and the river are made available on both sides from a viaduct level, thus doubling the average street capacity for a given sized freight house over that which is normally available with the present type of freight house of single deck construction which is mostly used in Chicago.

Objections may be made to this plan, to the effect that the present holdings are used to good advantage, and that the two-story construction would not be warranted. There now exist two precedents for such a modern type of construction, viz: the Soo line freight house now under construction, and

Note: A double-deck inbound-outbound house is now operated by the Soo Line in South Water St. and a simpler type of single-deck house with elevator

the proposed Pennsylvania freight house. While I do not specifically approve of either, I have applied the principles involved in these houses in the type of construction herein advocated to the extent that seems to me practicable and applicable to the present situation.

Present Occupancy. In order to fortify myself as to the possibility of further development of present holdings I have had an examination made to determine how well the holdings are used, the result of which is shown in colors in Plate IV. From this I can only conclude that either the railroads are holding much of this property for strategic purposes, or else they have failed to take advantage of their opportunities to make use of this land. Furthermore, in the various terminal studies herein presented, Plates I to III, it is shown that if the railroads would agree to pool their interests so that each individual holding could be developed to the best possible extent, more freight facilities would be available on the existing property between the river and Canal street, with the river as now located or as straightened in accordance with my recommendations, than are displaced by the locating of the new passenger station at Adams street, and a much greater capacity available if the passenger station is located at Harrison street and the space occupied by the proposed Adams street station is then utilized for freight purposes.

In justice to the individual railroad companies owning the property between Canal street and the river, in case all cooperation among them fails, and they are required to develop their individual holdings to the best advantage, it should be stated that neither the Pennsylvania nor the Alton now has sufficient space, properly located, upon which to develop adequate facilities for taking care of their needs for any considerable time unless they reconstruct and double-deck their freight houses, and equip them in a modern manner. In case this is done and the new passenger station is constructed at

service and storage above may be found in the M. C., G. W. and R. I. downtown freight facilities.

Adams street, as the companies propose, the Alton company could use all of the property north of Polk street, east of the new passenger station to the river, and provide itself with double the freight facilities it now has in the way of tracks, platforms and driveways, but would be limited to about 25 per cent. of its present team track capacity. The Pennsylvania company could construct on the land between Polk and Taylor streets and between the new passenger station and the river, freight houses with the necessary driveways and tracks to an extent equalling from 125 to 140 per cent. of its present facilities, but this would involve moving the team tracks back to south of 12th street, and their rearrangement in a somewhat less convenient manner. Since these companies, however, have pooled their interest in connection with the Union Passenger station they ought to be able to adjust their matters so as to pool their freight holdings, in which case their combined capacity could be increased by modern methods of construction to about 50 per cent. over their present capacity.

Thus looking at the freight problem from the most pessimistic viewpoint of the railroad companies as well as from the city's viewpoint, there is no immediate and pressing necessity for granting the Pennsylvania Railroad company any permission to cross city streets in order to utilize any additional property for freight terminal purposes. In case, however, such rights are granted they should be granted subject to the conditions set forth on pages 41 to 45, the principal requirements being the complete depression and covering of all tracks and the erection of such buildings upon the property as will not interfere with normal or efficient use of the surrounding streets, or otherwise make the freight houses objectionable to the communities in which they are located. With such conditions and the operation of all trains by electricity there is no good reason why any property now owned by railway companies in any part of the City of Chicago should

not be utilized for terminal purposes, provided the air rights are commercially developed to the greatest extent practicable, and the companies are required to pay the same rate of taxation on such property as contiguous privately owned property pays as the revenue from the terminal railroad property improved in this manner should enable the company to earn far more than the increased tax.

My recommendations on this subject are, however, that the question of individual ownership of the property between Canal street and the river must not be considered predominant if these interests are not in harmony with the most efficient plan of development for all parties concerned. including the City of Chicago; and that no authority for the improvement of any of this property be granted, either for freight or passenger terminals, unless the companies submit plans accordingly.

Pennsylvania and Union Station Ordinances: From an analysis of the ordinances asked by the Union Station company it appears that a liberal interpretation would permit far more latitude than was apparently intended in connection with the terminal project. Furthermore, the conclusion cannot be escaped that the city would concede to the railroads much valuable property without receiving commensurate consideration in return therefor. This does not seem equitable in principle or in practice, and a fair consideration of these ordinances should be based upon either an exchange in values or else the equivalent in concessions by both parties to the contract.

Whatever the intent of these ordinances, the concessions asked of the city appear to be so great as to justify a refusal without equal concessions on the part of the railroads, unless further restrictions be determined upon and more definite terms written into the ordinances, in case it is decided to grant them.

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Review of Report of Mr. John F. Wallace: While I concur with Mr. Wallace in certain of his recommendations, hereinafter mentioned, as to physical matters, I do not concur with him as to policy, wherein he assumes and states that nothing can be done with the present railway companies regarding the vacating or the development of their present properties until such time as they voluntarily see fit to act, for the reason that it is not at all apparent that many of the roads will not be willing to voluntarily undertake to solve the terminal problem on broad lines, and co-operate in such a plan, provided it recognized the rights of all roads on an equitable basis. Neither is it to be taken for granted that roads now holding preferential positions cannot be required to join in such a plan, the contention of some of the interested roads to the contrary notwithstanding. Chicago has succeeded, in the past few years, in the face of strong corporate opposition, in establishing universal through-routing of its surface and elevated transit lines, and it is but fair to assume that if it undertakes to secure similar and other reasonable benefits for its citizens at the hands of the steam railroad companies that it will, in the end, through moral suasion or proper municipal or state regulation, succeed.

Especially is this true when it is considered that the city is now in process of developing a rapid transit subway system in connection with elevated and surface lines, and the location of railroad passenger terminals on such sites as to properly co-ordinate with this system is one of the fundamental things to be considered and safeguarded by both city and companies at the present time.

Mr. Wallace's direct recommendations are as follows:

I. "It is my recommendation that an ordinance for a Union Passenger Terminal at the location proposed by the Union Station Company be granted."

II. "It is my recommendation in respect to the proposed freight terminal of the Pennsylvania Company that

the plans relating to the elevated approach tracks, and the location of the main freight building be modified as herein suggested, and the ordinance, when amended to conform to the changes specified, be granted."

The above recommendations in effect permit the Pennsylvania railroad and associated companies to erect their Union Passenger station in the location asked for, and without any change in the general arrangement of the station, tracks, facilities or roadways adjacent thereto. They permit the Pennsylvania Railroad company to build its freight terminal as contemplated, but removed one block south, and with a depressed but not necessarily covered track entrance instead of an overhead approach.

Mr. Wallace's supplemental recommendations are as follows:

1. "The elimination, in the course of time, of three of the existing passenger terminals—the Dearborn, the La Salle and the Grand Central." (Whose traffic is to be transferred to the proposed Illinois Central Lake Front site at 12th street.)
2. The double-decking of Canal street (limits or levels not defined).
3. Widening of Canal street to 100 feet from 12th street to Harrison street (along the property of the Chicago, Burlington & Quincy Railroad).
4. Extending Canal street 20 feet east over the suburban tracks.
5. Clearing out of the lower business district and the restoration of through streets.
6. The extension of Canal street by viaduct across the river in a northeasterly direction, so as to provide a connection between the North Side and the West Side.
7. Extension of Monroe street across the river with a new bridge.
8. Location of the proposed Pennsylvania freight terminal so as not to interfere with the contemplated development of a civic axis in Congress street.

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9. "It should be the policy of the city to enlarge, widen or extend its streets and thoroughfares leading to the southward and not to permit further encroachment thereon."

After reviewing the presentation of Mr. Wallace as embodied in the above recommendations and supporting discussion, I find myself in agreement with him on certain points and in disagreement on others. I concur in Numbers 2, 3, 4, 5, 6, 7 and 9 of his recommendations which I have above termed "supplemental", and conditionally concur in Number 1, if after a thorough investigation one or the other of the plans preferred by me, as previously described, cannot be worked out and adopted wherein the La Salle street station would be retained for suburban business only, with approach tracks underground. I disagree on both of his direct recommendations, described above as I and II, and with Number 8 of his supplemental recommendations.

In general I regard the present location of the Union Station as one of last resort, incapable of future expansion, and not at all located with reference to the recognized trend of business movement southward, or in conformity with the general policy of co-operation between the roads in working out a better solution.

I am entirely in disagreement with any recommendations for a new freight terminal in the position proposed, not only for the reason that, in my judgment, it would hurt instead of help West Side development, but principally for the reason that the additional area is not yet needed. I find nothing in Mr. Wallace's report seeking to discover ways and means to develop the existing properties to their fullest extent, based upon a plan of co-operation between the railroads, as he seems to have assumed that they could not be induced to pool their issues. Consequently, before deciding to disagree with his recommendations in this respect, I have proved to my own satisfaction that the roads have room enough already for their needs if they will develop their properties more efficiently.

I cannot see the logic or fairness in allowing the Pennsylvania company to proceed without any consideration of the much needed co-operation among the roads in the working out of a plan whereby all of them would consent to eventually change their present passenger terminals, so as to open the business district as desired.

This co-operation plan must be accepted or rejected. The first step is in the hands of the Pennsylvania Railroad; and with no consideration on its part, the other roads cannot be expected to conform as readily to the demands of the city for expansion.

The Illinois Central site I have studied for some time, and I concur with Mr. Wallace in the desirability of making this site a clearing house for eastern and southern roads.

In concurring with Mr. Wallace regarding the proposed bridge in Monroe street, I do so recognizing that the Union Station ordinance prevents such a bridge being built, and have elsewhere called attention to the necessary change.

While widening a street by the arcade method, as recommended by Mr. Wallace for Harrison street, might be desirable in some cases, I cannot concur to such a method for so important a thoroughfare as Harrison street, especially in view of the fact that it may become the civic axis.

The moving of the freight terminal south one block from Van Buren to Harrison street does not, in my judgment, constitute any material concession, and certainly not a sufficient concession to warrant asking the east side roads to materially modify any plans for terminal development that they may have.

Mr. Wallace emphasizes, and justly so, that the need of the hour is something practicable and not visionary. But I cannot blind myself to the situation confronting the citizens of Chicago in the face of a demand on the part of the railroads for more terminal space, when these roads, owing to individual differences, do not develop their present holdings.

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if the city fails to recognize the situation and exercise its authority in requiring co-operation when there is an opportunity to do so.

It is true that granting of the ordinances will probably produce in a short time these magnificent terminal properties on the west side. But if by so doing the property and needed development of the business district is seriously restricted for many years to come, and the railroads plunged into needless expense for terminal properties, I regard it as safer and wiser for the city to defer its final approval of these west side terminals until some agreement has been reached with all of the roads affected.

Briefly, instead of mild acceptance of the companies' demands, I ask for co-operation, and I believe that if the matter is approached in this spirit by the city that the great majority if not all of the railroad companies will approach the city in the same spirit, and that practical results will follow.

Therefore, I take the position that in the matter of terminal development, the city from now on should exercise careful, direct and detailed supervision, in order to guide into the proper channels railroad development, enforced if necessary through the temporary withholding of desired privileges, if this co-operative spirit on the part of the railroads is not evident.

In the absence of such a policy, the recommendation of Mr. Wallace for "the City to enlarge, widen or extend its streets and thoroughfares leading to the south and not to permit further encroachment thereon" will become impossible of attainment.

His recommendation for the confinement of terminal facilities within established or widened street building lines is fully concurred in by me.

Mr. Wallace recommends depressed tracks to the proposed freight station, meaning presumably "open-cut" construction. This, in my judgment, would be nearly as great a bar-

rier as overhead structures, and I believe and recommend that these tracks, if permitted at all, should enter by means of covered subways. I have indicated on my plans one way of accomplishing this in a practicable manner, but it should be understood that there are other ways than the one shown by me for accomplishing this result.

He also observes that "It would not seem advisable from the practical railroad point of view for any railroad to give up a satisfactory, convenient and preferential location" and "The preferable location of any railroad passenger terminal over another is measured by its greater convenience to and accessibility by the public." The position I have taken regarding the Pennsylvania Railroad simply recognizes that, in view of this probable attitude of the railroads, the consummation of the desired plan cannot well be brought about without some concession on the part of those railroads most favorably located, viz.: the Pennsylvania and the Lake Shore & Michigan Southern division of the New York Central Lines.

Summary of Conclusions: As the result of my study, the details of which are fully set forth in the report, I am convinced that the City of Chicago should grant no further ordinances to steam railroads or other railway companies seeking to rebuild their present terminal facilities or to construct new terminals, unless the ordinances contain definite provisions making the following fundamentals mandatory upon the road or roads benefited by the ordinance:

1. An agreement to co-operate with the other railroads affected, and with the city, in straightening the south branch of the Chicago River, in some such manner as previously discussed.
2. The placing, within a definite time, of all tracks of the steam railroad companies in covered subways beneath the street level, within the district bounded by 12th street, Halsted street, Lake street and the lake front (except the elevated tracks of the new C. & N. W. station and such tracks as are now or may hereafter be located within the present de-

pressed area between Canal street and the Chicago River; also the tracks of the Illinois Central Railroad along the lake front; tracks in these two latter locations to be depressed to about two feet above city datum).

3. An agreement to co-operate with other railroads and the city in working out a plan which will open from time to time some and, ultimately, all or practically all, of the north and south streets between State street and Canal street, and all, or practically all, of the through east and west streets between Randolph street and Harrison street, and also Polk, Taylor, 14th and 16th streets, which are now blocked by railroad property.
4. The concentration of long distance passenger traffic into the fewest number of terminals practicable, and at such locations as will offer the least obstruction to the extension of the business district, consistent with reasonable accessibility therefrom.
5. An agreement to co-operate with the other steam railway companies and the city in the development to its fullest extent, along the most efficient modern lines, of the property now owned by various railroad companies within or contiguous to the business district of the city, with the ultimate object of the complete development of such property, so that the property now occupied by the companies in the business district between State street and the river can be vacated and devoted exclusively to business purposes, or the surface released for railway purposes by placing the tracks under ground and developing of the property above the surface for business purposes.
6. Where streets or alleys are closed, temporarily or for long periods, an equivalent area or value commensurate with the period of occupancy shall be given in return by the railroad in widening other streets.
7. The city to reserve control over all sub-sidewalk and sub-pavement space, not specifically vacated in the ordinance, that may be required for suburban transportation systems or other public utilities.
8. An agreement to co-operate with the city in the establishment of elevated thoroughfares across the railway property lying between the south branch

of the river and Canal street, and westward as may later be deemed necessary. This system to be co-ordinated with the bridge levels established by the city and with the necessary changes in north and south thoroughfares to equalize the grades, so as to facilitate vehicle traffic. The ordinance to provide means for ascertaining and finally to stipulate the division of cost of such changes proportional to the relative benefits derived by the city and the companies respectively.

9. Provision for a marginal way or river road contiguous to the river, extending along the railroad property west of the river between Lake street and 16th street, and the development of suitable docking facilities, municipal or otherwise, along the entire way, and underenath the bridge approaches where practicable.

10. Provision in all passenger stations hereafter constructed for through connected or interchange tracks, so as to permit interchangeability of suburban service between roads operating in different parts of the city.

11. An agreement to co-operate with other roads to interchange the use of coach yard facilities with each other, if necessary to carry out the through-routing or interchange principle for suburban service.

12. Commitment to the effect that the company will co-operate with the other roads in the working out of a general plan whereby the roads may be systematically grouped and brought into two or more terminal stations with the least amount of track occupancy.

13. An agreement to co-operate with other railroads and the city in establishing universal facilities at Clearing, or some other point, by means of which package freight (less than carload lots) now interchanged in the downtown district, will be interchanged at such clearing point, and thus prevent hauling freight into the business center and back again as is done at present,—the effect of which would be to release present downtown freight facilities for the legitimate use of freight destined to and from the business district.

14. The removal of obstructions due to railroad occupancy which decrease the width of the river channel as now established, so as to permit the construction of bridges without encroaching upon this river channel.

15. The granting of an ordinance to the Pennsylvania company for a passenger terminal need not be conditioned upon the granting of an ordinance to the same company for the use of the proposed freight terminal; for it is not evident that the company will need this additional territory for freight purposes for many years to come if the roads owning the property between Canal street and the river would co-operate in developing it to its fullest extent.

16. By means of double decking Canal street it makes the property west of and contiguous to Canal street available for terminal purposes, and there is no reason why, if after analysis, additional property is ultimately needed for freight purposes, it should not be allowed west of and contiguous to Canal street, provided tracks are kept underground and the property developed overhead for business or manufacturing purposes.

17. How far these recommendations are enforceable through the Interstate Commerce Commission or the State Public Utilities Commission should be a subject for further study, but Chicago should now avail herself of the opportunity to regain control of her traffic districts.

18. Inasmuch as the Chicago Plan Commission has been established and has done such extensive and commendable work for the betterment of Chicago, which has been recognized by having certain of its recommendations carried out, such as the widening of Michigan avenue and 12th street, and the present Lake Front Park, the city authorities should still further see that no structure is reared by any railroad company which will prevent the ultimate realization of such parts of the original plan laid down by Mr. Burnham as have met with the official approval of the Chicago Plan Commission. And it is possible that this Commission, act-

ing jointly with the railroads, might constitute the proper channel through which this or some other satisfactory plan may be carried out.

The easiest thing for the city to do is to require nothing and let the railroads have what they ask; the most difficult thing for the city to do is to require the railroad companies to carry out the plan best suited to the entire city at their own expense; the just thing to do is to join with the roads in carrying out, on some equitable basis, a plan which will gradually put into effect such recommendations in this report and those of Mr. Wallace as are considered sound, and some practicable method should be formulated for such a procedure.

In closing I wish to state that I fully realize the magnitude of this problem and the enormous costs and difficulties involved, not only to the railroad companies but also to the city, in the rearrangement of the properties in accordance with the suggestions herein made, and do not wish to be understood as counseling any one-sided policy of compulsion on the part of the city for the carrying out of any of these suggestions. I hope, however, that this preliminary report will be found sufficiently broad and analytical to set forth the dimensions of this problem, so that no action will now be taken which will make it impossible to carry out these suggestions if they prove themselves meritorious after mature consideration.

Respectfully submitted,

Consulting Engineer.

BRIEF SUMMARY OF REPORT.

Four fundamental principles are advocated:

A. The straightening of the river and opening up of many additional north—south and east—west streets.

B. The depression and placing in covered subways of all railroad tracks between Halsted street, State street, 12th street and Randolph street, except the tracks of the Chicago & North Western terminal, which are assumed to be reasonably permanent, and the tracks of the Illinois Central Railroad company, and those tracks lying between Canal street and the river, but the last two to be somewhat depressed.

C. The development and more efficient use of present railroad property in the business district, and the probable ultimate rearrangement and better use of the outlying tracks leading to this district.

D. Provision for interconnecting the main railway stations with additional suburban station facilities in such a manner as to inaugurate the principle of through routing between the different railroad systems, by means of which a high speed through routing service could be established between the different main divisions of the city and adjoining suburbs.

1. **Influences Affecting Terminal Problems:** Terminal problem differently looked at from the standpoint of the railroad corporation, the municipality, local tax payer, real estate dealer, the commuter, the traveler, the stockholder, the bondholder, the management of the railroad, the financier, the city shipper, the through shipper and the lake shipper.

2. **City Plan of Chicago:** City Plan of Chicago, as approved by the Chicago Plan Commission, should be supported.

3. **Growth and Future Development:** Law determined for the probable growth and future development of the passenger

business of the territory surrounding Chicago. From this it is found that railway passenger traffic will increase very much faster than the population; train movement as the square and passengers as the cube of the population, for which facilities must be anticipated.

4. **Rapid Transit Development:** The necessity for co-ordinating any proposed passenger terminal plans with the local transit facilities, both surface and subway lines, is shown, and the possible utilization of the present steam railroad lines for serving the outlying suburbs by means of the through routing of trains throughout the entire district, in a manner similar to that of the present surface lines and elevated roads.

5. **Organization of Freight Handling Facilities:** The present scheme of freight handling is analyzed with reference to its adequacy and efficiency, and methods are suggested where great improvements may probably be made, and remedies suggested for the present inefficient use of railroad property, such as the exclusion of all interchange freight from the central business district; also the discussion of the clearing idea to cover package freight. Studies are presented for utilizing the present railroad property to its maximum possibilities, making unnecessary the acquisition of additional property in the business district to be used for freight purposes.

6. **Water Transportation:** The development of the river frontage to its maximum capacity for rail-to-water service, and the establishment of public markets and dock facilities are discussed and suggestions made for future development.

7. **Studies in Capacity and Efficiency of Operation:** In analyzing various types of railroad stations, with the object of determining the relative merits from the standpoint of capacity and economical use of area, it was found that the stub terminal and the through terminal are on a much closer parity, under practical conditions of operation, than they are

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usually considered to be. Furthermore, it became apparent that the consolidation of terminal facilities could only be carried to advantage as regards capacity and operating efficiency, in so far as the station would not become unwieldy and inconvenient of access.

8. **Analysis of Terminal Plans Presented:** All of the terminal plans that have been proposed for the reconstruction of the terminal situation in Chicago were subjected to a uniform method of analysis and certain functions of each adopted in the plans finally suggested in so far as these seemed to fit into the general plan recommended.

9. **Analysis of Pennsylvania Ordinances:** The Pennsylvania ordinances are analyzed to determine their bearing upon the recommended terminal plan, as well as to determine the fairness of the provisions in return for the privileges granted from the city. While it would undoubtedly permit the construction of a station on the Adams street site of sufficient capacity to take care of the needs of the railroads interested for some time, the ordinances do not sufficiently conserve the city's interests in the matter of supplementary street improvements, and the return of the equivalent value for such privileges as are asked.

10. **Possible Regrouping of Railroad Facilities:** A number of different schemes for station development on the unit plan are considered, together with the regrouping of the necessary railroad entrances, in order to accomplish the best results; and in the alternative routing plans shown, the minimum number of railroad crossings and bridge crossings over the river have been considered governing principles in order to secure the shortest and quickest entrances to the respective terminals considered. As a result it is shown that as high as 8 miles of route and 30 minutes in running time can be saved by more direct routing.

11. **Passenger Terminal Modifications:** As a result of the

previously mentioned capacity studies it appeared desirable to reduce the number of stations to the minimum practicable, and as some of the railroads fall into natural groups, owing to geographical locations, the general scheme of the plan developed which seems to best suit the conditions in Chicago, both present and future, consists of two elements: one represented by the single large station development of the Illinois Central company on the lake front at 12th street, and the other, or variable element, by a unit station scheme extending from the first North Western unit southwest along the river, with consecutive additional stations built as fast as the business district grows southward. Thus assuming the North Western station to be fixed, and that an additional station is now required, the plan preferred, all things considered, is to locate this new station immediately south of Harrison street. Alternatives, however, are presented.

12. **Freight Terminal Facilities**: The subject of freight terminal development has been approached solely from the viewpoint of what capacity can be developed from a given area, and as a result of the analysis and the application of modern methods, it is shown that not only is the additional freight area desired by the Pennsylvania to the west of the river unnecessary, but also that the area at present occupied by the several roads can be developed to a sufficient capacity to last for the distant future; the only consideration being that the railroads pool their freight facilities in the same manner that they have already, in groups, pooled their passenger facilities.

13. **Scope of Further Investigation**: This investigation has developed into such proportions and scope that if the conclusions of this report are not acceptable further studies must be carried out to determine the contested points, and for this reason certain lines of investigation have been suggested, not only of a technical nature, but also questions that should be investigated from the legal, financial and corporate viewpoint.

14. Intercorporate Relationships: It is pointed out that the fundamental necessity for the success of the plan presented is for the railroad companies to find a way to agree to co-operate with the city upon a method for carrying out this plan or such modifications as may be subsequently made.

15. Powers of the Municipality: The plans suggested are not intended to be based upon impossible conditions as regards the ability of the city or the companies to carry them out, for which reason those powers which it is believed the city and the state now possess have been reviewed.

Report of Mr. John F. Wallace: Concurrence and non-concurrence set forth in detail on pages 36 to 41 of main report. Briefly, the general method of street improvement and the extension of the business district, recommended by Mr. Wallace is concurred in, but the retention of the Pennsylvania freight site is not concurred in, nor is the unconditional retention of the passenger terminal site at Adams street; and in fact another site is recommended in this report as preferable. Neither is the premise accepted that present divisional occupancy and operation of railroad properties must govern their ultimate disposition in meeting the necessities of terminal reorganization herein recommended.

RAILROAD COMPANIES THAT HAVE FURNISHED STATISTICAL DATA.

Atchison, Topeka & Santa Fe Railway Company
Baltimore & Ohio Railroad Company
Baltimore & Ohio Chicago Terminal Railroad Company
Chicago, Burlington & Quincy Railroad Company
Chicago & Alton Railroad Company
Chicago, Milwaukee & St. Paul Railway Company
Chicago Great Western Railroad Company
Chicago, Indiana & Southern Railroad Company
Chicago & Eastern Illinois Railroad Company
Chicago & Erie Railroad Company
Chicago, Indianapolis & Louisville Railway Company
Chesapeake & Ohio Railway Company of Indiana
Chicago & Western Indiana Railroad Company
Chicago & North Western Railway Company
Chicago, Rock Island & Pacific Railway Company
Cleveland, Cincinnati, Chicago & St. Louis Railway Company
Chicago River & Indiana Railroad Company
Grand Trunk Western Railway Company
Illinois Central Railroad Company
Illinois Northern Railway Company
Lake Shore & Michigan Southern Railway Company
Michigan Central Railroad Company
Minneapolis, St. Paul & Sault Ste. Marie Railway Company
New York, Chicago & St. Louis Railroad Company
Pere Marquette Railroad Company
Pittsburgh, Cincinnati, Chicago & St. Louis Railway Company
Pittsburgh, Ft. Wayne & Chicago Railway Company
Wabash Railroad Company

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Statistical and Descriptive Section of Report

SECTION 1.

INFLUENCES AFFECTING TERMINAL PROBLEM.

A broad and unbiased study of this problem calls for consideration of the rights and *viewpoints of the many interests concerned,* which are briefly set forth here in order to emphasize the impossibility of reaching conclusive decisions until the full facts are available:

1 **The Railroad Corporation**—viewing its properties, realty holdings, terminal advantages, operating rights and investment from an individual rather than a community point of view, thus reflecting the attitude of a foreign directorate.

2 **The Municipality**—vitally interested in the proper physical and aesthetic development of the industrial properties within its borders as well as in the convenience of its citizens.

3 **The Local Taxpayer**—who questions the justice of enormous railroad holdings within his city being assessed at merely a fraction of his own assessment rate while he is required to contribute a proportionately greater share to the support of the municipal government.

4 **The Real Estate Owner**—generally in favor of any plan that benefits his property without considering the best interests of the city as a whole and who as loudly protests against the depreciation of his property values by contiguous railroad properties, and whose views are equally divergent upon the desirability of a railroad or loop terminal location depending upon whether his property is inside the "loop" or outside.

5 **The Commuter**—satisfied with moderate terminal facilities if low fares and reasonable convenience are available with quick access to the business district.

6 **The Traveller**—favoring that road with the shortest running time, the best equipment, the most imposing terminal architecture and maximum terminal conven-

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iences without so much regard to location, as his lack of knowledge of the city forces the use of taxi cabs. Here the advertising value of the expensive terminal is evident.

7 **The Stockholder**—often interested only in a maximum return upon his investment without much regard to methods of operation and often with none at all in the welfare of the community.

8 **The Bondholder**—retaining through the trustees the absolute ownership and control of present property which cannot be disposed of outright without his consent except through long term leases and operating agreements.

9 **The Management**—under continual pressure for maximum dividends, adherence to schedules, better equipment, and the demands of the suburbanites for more and faster equipment in the face of increasing operating expenses and competition from long-haul rapid transit lines.

10 **The Financier**—guaging the amount and discount of his loan largely by the record of annual surplus shown on the road's balance sheet.

11 **City Shipping**—desiring freight terminal facilities located as close to point of originating tonnage as possible in order to avoid delay and expense in extra cartage. Obviously too close concentration within congested district defeats the purpose in view.

12 **Through Shipper**—interested only in prompt transfer through the Chicago District with the least rehauling, which practically dictates the clearing system now being installed.

13 **Lake Shipping**—the success of which practically depends upon cheap and convenient trans-shipment facilities that can only be brought about by the most intimate contact between rail and water, supplemented by interchange clearing and union freight stations.

Analysis of all these extremely conflicting viewpoints reveals the fact that in the main the decision of all parties interested as to the merits or demerits of any terminal plan

proposed is practically guided by individual interest and in this respect the municipality is no exception. How, then, may a just balance of interests and equities be found? The method followed in this report is that of disinterested technical analysis:

1 Analysis and classification of each proposal.
2 Balancing of advantages and disadvantages from the viewpoint of the greatest good to the greatest number.
3 Determination of capacity and commercial feasibility.
4 Assumption of reasonable co-operation between all interested parties, especially the railroads and the city.

In the present situation the property values and equities involved are so large and the interests so complicated as the result of long years of development, rearrangement, reorganization, acute competition and lack of adequate municipal supervision that the question immediately arises:

> Shall expediency and minimum cost govern, or shall broad permanent development based upon the lessons of the past and the unquestioned needs of the future prevail?

Here there are the two extremes: The corporation hesitates to plunge into a large investment for the distant future, especially during a close money market, and, therefore, follows the line of least resistance and uncertainty in providing only for the immediate future. On the other hand, enthusiastic supporters of the comprehensive City Plan are convinced that piecemeal and disorganized development for the present only will simply intensify the problems of the future. Both are right to a degree and in the analysis the problem is to find the middle ground, if possible, upon which these conflicting interests may unite upon a constructive program of necessity and moderation.

It is not difficult to see that in this emergency the railroads themselves should unite in a co-operative terminal program, which, through the pooling of common interests, can

alone secure for them adequate development at minimum cost. In the absence of such co-operation, truly *all economic progress must cease* and the useless duplication of capital ensue. It is hoped that this policy will not be adhered to in Chicago where practically every railroad is facing a demand for terminal enlargement, and it is upon this assumption of co-operation, voluntary if possible, but compulsory if necessary, that the various plans in this report are discussed.

SECTION 2.

CITY PLAN OF CHICAGO.

Cheap and efficient transportation is acknowledged to be the one great essential to civic and industrial growth of a community, which relates to local and suburban as well as to through or long distance travel. And in executing any plan for improvement, it is equally necessary that an efficient city plan be laid out at the earliest moment practicable and rigidly adhered to, at least until improvements in the plans become apparent. Such a plan has been worked out through the commendable efforts of the Chicago Commercial Club by its technical representative, the late Mr. D. H. Burnham, who has laid before the citizens of this city for their future guidance an adequate conception of a useful as well as attractive city.

Chicago Plan Commission: Out of this beginning grew the present Chicago Plan Commission which, acting under authority of the city government, was entrusted with the development of a City Plan with such modifications of the original Commercial Club plan as it found desirable. The execution of its recommendations, which alone are entitled to recognition as the official "Chicago Plan" remains, of course, in the hands of the city authorities.

It happens that two of the most important elements of the

City Plan are now placed in jeopardy through recent developments in the disposition of railroad terminals:

(a) Location of the axis to the City Plan and of the Civic Center.
(b) Location of the inner ring of wide distributing thoroughfares surrounding and serving the business district.

After due consideration the Chicago Plan Commission has concurred in the original proposals of the Commercial Club in these two important particulars so that the burden of proof of the incorrectness of these conclusions seems to rest upon those who seek its modification, *i. e.*. the Pennsylvania Railroad and its associates in the Union Station project. Such proof does not appear from the records, and it is, therefore, the only possible conclusion that the civic axis as well as the inner ring of the Chicago Plan must be preserved at all costs whether possible of *immediate* execution or not.

Civic Axis: The selection of Congress street as the axis arose from the natural focus of existing diagonals (Blue Island avenue and Grand avenue projected) at the intersection of Halsted and Congress streets (projected) at which point the civic center finds a logical location. This plan, however, is by no means inflexible and the Chicago Plan Commission has itself indicated a willingness to accept either Harrison street widened or Congress street projected, either of which would fulfill in general the requirements of the Chicago Plan. But it opposes and rightfully, the shifting of the civic axis northerly to an indefinite location suited only to the purposes of the proposed Union Station without due regard to the evident demands of the street plan and the future needs of down town Chicago. Evidently such shifting should concur with the general direction of movement of business and population.

It has been shown that the geometrical center of population is steadily progressing in a southwesterly direction and is

now at approximately 22nd and Fisk streets. By reason of the river barrier to the north and west, commercial development has been forced southerly through the narrow throat at 12th street as evidenced by the transformation of South Michigan avenue. These facts require recognition in some such form as the Chicago Plan Commission proposes in the widening of 12th street and the provision of a new axial artery at Congress street.

Artificial Barriers: It needs no argument to justify the demand for additional and wider streets within this congested district and the gradual removal of artificial barriers to its normal expansion such as exist in the present condition of the Chicago River frontage and in the disproportionate holdings in railroad terminal property, particularly in view of the inefficient use of this property. In the quadrangle bounded by Chicago avenue, Halsted street, 22nd street and the lake, 25 per cent. of the area available is occupied by railroads, most of it in a primitive state of development, which occupancy extends completely around the river on the north and west and so far encroaches on the south that *only one city block between railroad property and the lake remains for commercial development of the business district to the south of 12th street.* (See Fig. 1.)

This condition has rightfully become of most serious concern. But, in spite of this, the Pennsylvania interests propose a still further restriction of normal city growth to the westward by the absorption of 10 blocks of additional property and the erection of elevated structures on this right-of-way that will unquestionably constitute a most serious additional barrier to the westward. This plan as proposed, opens no new streets; it enormously intensifies the traffic on existing streets (even using Harrison street, one of the proposed civic axes as its main trucking thoroughfare); it blankets about 22 additional streets with overhead structures and in fact closes some existing streets. Instead of removing existing

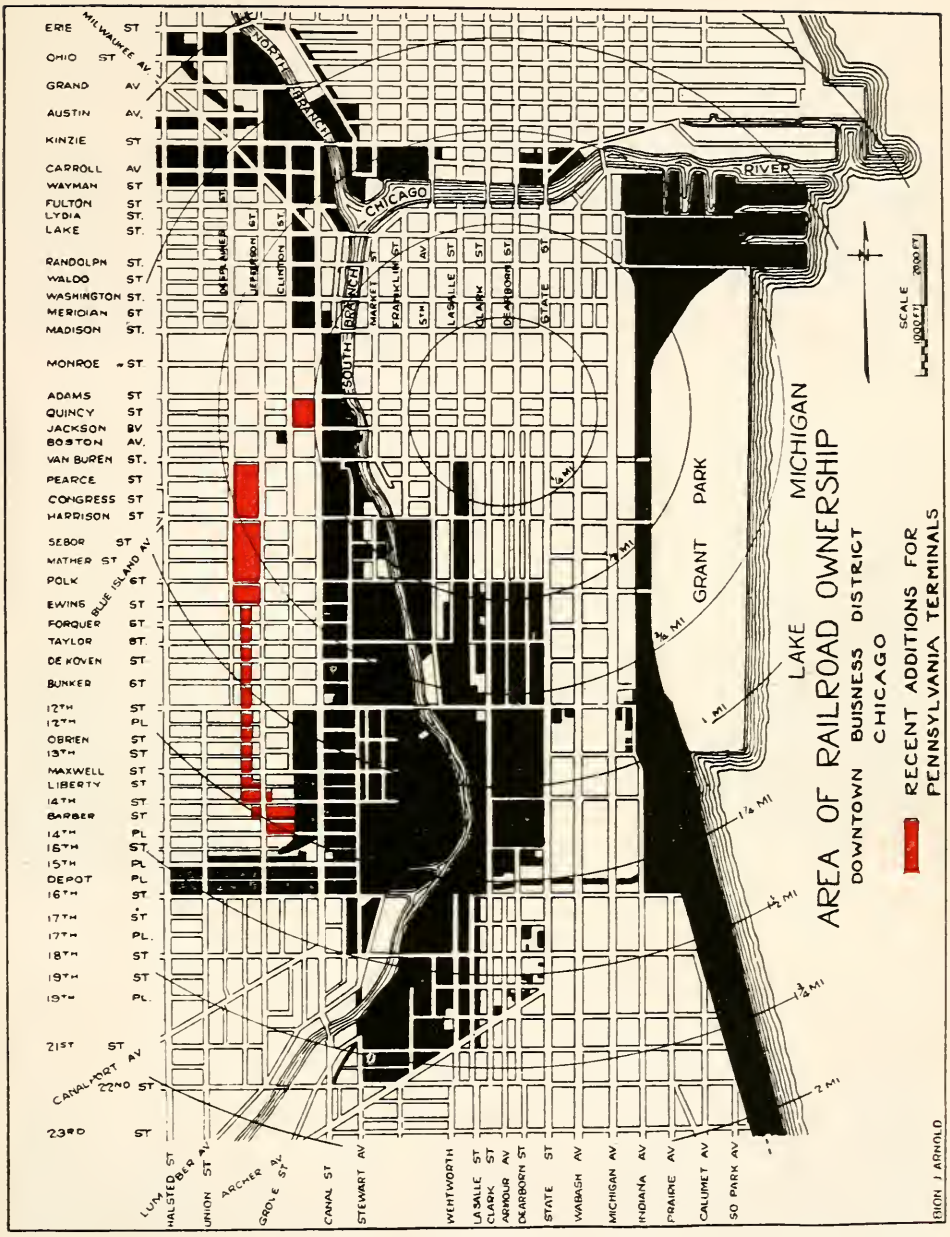

FIGURE 1. RAILROAD OWNERSHIP.

The area shown in black indicates the great extent of railroad property within the Chicago Business District, hampering growth and causing much congestion. The area occupied south of Harrison St., between Canal and State Sts., has forced practically all traffic south-bound from the business district into three streets and has placed almost insurmountable barriers in the way of traffic across the area from State Street to Canal Street. The area shown in red represents the proposed freight development of the Pennsylvania and affiliated lines and indicates the tendency toward extending this so called "Chinese Wall" of railroad property still further.

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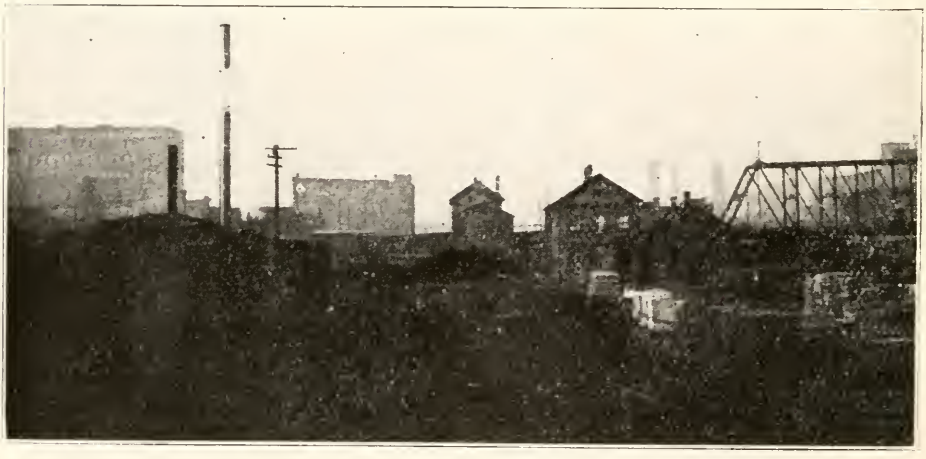
LOOKING NORTH FROM 14TH STREET AND 5TH AVENUE (EXTENDED).

LOOKING NORTH-EAST FROM CANAL AND 12TH STREETS.



EAST OF CANAL STREET LOOKING NORTH FROM BUNKER STREET.

INEFFECTIVE USE OF EXISTING RAILROAD PROPERTY.

humps and steep approach grades to the river bridges, it actually increases them and while some street widening along Canal street is proposed, such widening is largely in the interest of the railroad company itself and does not extend north of Van Buren street. That these conditions are inimical to reasonable and necessary progress in city planning is evident.

Effect on Realty: What effect existing railway occupancy has had upon adjacent property is clearly illustrated by the condition of private property at present on the west side along the very streets it is claimed will be benefited by the Pennsylvania plans, viz: Canal, Clinton, Jefferson streets, etc. A detailed study of present occupancy throughout the city clearly shows that where there are railroads unimproved by grade separations, there also are tenements of the lowest class, or industries for the most part employing unskilled labor. In fact, the various trunk lines and yards of the railroads may easily be traced out on the city map by the location of these industrial and tenement districts.

A study of realty values indicates that while many other conditions operate to occasion wide fluctuations in the value of city realty, the character of occupancy of most of the property facing on freight areas, forces high class commercial development elsewhere. The reaction is then inevitable, resulting in fictitiously high prices for realty in those districts free from the influence of railroad property, which contributes to the downtown congestion.

Street and Viaduct Plan: Enough has been said to illustrate the important bearing which any terminal re-arrangement must have upon the City Plan, of which the street plan is a most important part. It is impossible in this report, and in fact, unessential for its particular purpose to discuss in detail the many changes in street plan occasioned by the Pennsylvania Union Station ordinances, or by the modification thereof suggested in this report. The exact working out

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of this detail forms a logical field for the Chicago Plan Commission which has been organized for this purpose; consequently only such matters of general policy have been touched upon here as are deemed vital to the particular plan in view. These refer to streets, viaducts, bridges and the straightening of the Chicago River. Sufficient detail has been included in the plates of proposed modifications herein presented, to give a general idea of the elevations, viaduct junctions, inclines or ramps and river frontage, but much detail work remains to be done to perfect these plans.

In Section 9 devoted to an analysis of the Pennsylvania ordinances, will be found a measure of the changes which these ordinances introduce. The following points relate to all proposed plans:

A marginal way or river road ought to be established along the west bank of the river as a new thoroughfare connecting the system of east and west thoroughfares, especially in that territory where any of these east-west streets have been cut off by railroad property. And it is especially necessary, in connection with the improvement of the river frontage, for developing a continuous water-to-rail connection along the river that is so much needed. While the opportunity is available, this river road should not be lost sight of and should become a definite consideration in any re-arrangement of terminal properties. The amount of street vacations asked for by the railroads is more than enough to provide an equivalent in a river road especially when the railroads are permitted the use of the lower deck of the river road, if carried out as a double deck structure. While the Pennsylvania Plan proposes an elevated marginal-way over its tracks from Adams street to Jackson boulevard, this is primarily for the use of the patrons of the Union Station and is entirely inadequate as a new north and south thoroughfare. In order to form a consideration of merit in the terminal proposals, this river road should be extended the entire length

of the property occupied by all of the railroads, at least along the west bank, if not also the east bank of the river.

The viaduct system that seems best to suit the conditions of Chicago is one which will permit all principal east and west streets that cross the river to be extended westward across the railroad property (at least as far as Canal street) as near the elevation of the city bridges as the railroad property beneath the viaducts will permit. In connection therewith Canal street should be double decked for the greater part of its length along railroad property and tied into the east and west viaduct system in such a manner that all the existing and contemplated freight and commercial development along Canal street, where double-decked, would be provided with second floor delivery direct from the Canal street and viaduct system without descending to the ground. At the same time the west side street system should have direct enough access to the lower deck of the Canal street frontage without ascending the inclines or ramps. Necessarily, the block between Canal and Clinton streets must be used for these inclines or ramps, descending from the viaduct level to the west side street levels. With this street system—low level from the west and high level from the east—two-story freight house development along Canal street becomes desirable and efficient as a means of developing the railroad property to the maximum advantage. Several schemes of such development are shown elsewhere in connection with the plans proposed herein. (Plates I to III.) The elevations to be adhered to in this street and viaduct system are practically determined by the necessity of keeping the railroad tracks above datum and by the necessary clearance under railroad bridges; but the studies herein seem to indicate that a very desirable and eminently practicable two level street system may be devised with proper co-operation of the railroads and city.

North Side Connection: A most evident improvement needed at the present time is a boulevard or street connection

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across the North Branch, sufficiently unobstructed by tracks and heavy teaming so as to provide a rapid connection from one of the north side streets to Canal street and the railway stations. At the present time there is no north and south through street car connection in the vicinity of the North Western and Union Stations between Wells and Halsted streets. While Orleans street is served by a car line as far south as Kinzie street, and Clinton street as far north as Milwaukee avenue, there is no method of crossing directly from the north side without a wide detour westward to Halsted street or eastward through the business district with two river crossings and a transfer. The obvious need is a connection from the intersection of Orleans and Kinzie streets to the intersection of Canal and Lake streets.

One of the alternative plans shown herein (Plate II B) presents one method of crossing the North Branch, as worked out by the officers and engineers of the Chicago Plan Commission. In some respects this is not ideal, as it introduces another bridge crossing the Chicago River at a point so near the bend or turning basin, as to apparently offer considerable obstruction to navigation at this important point. But, the Chicago Plan Commission contemplates an alternative method in the use of a double deck bridge in Kinzie street so as to connect Orleans and Canal streets with an elevated boulevard between Kingsbury street and Lake street, thus avoiding all track crossings.

In this provision of north and south connecting thoroughfares, I am thoroughly in accord with the recommendations of the Chicago Plan Commission and Mr. Wallace.

New Bridges: Whatever the final development of the properties in the vicinity of Adams street and west of the river may result, a new bridge in Monroe street should certainly be provided for across the property of the Pennsylvania Railroad by suitable viaducts; and no structure or provision in the ordinances should be permitted to interfere with such a plan. And

in this connection, the widening of Monroe street from La Salle street west would prove desirable as an additional thoroughfare leading westward from the heart of the present business district, though not an immediate necessity.

Similarly, a new connection by bridge across the Chicago River is needed in Franklin street, which street is of unusual importance for facilitating proper street car routing. This new connection would be especially necessary if the river is straightened to the westward and a new north and south thoroughfare provided, as indicated in Plates II and III.

Straightening of the Chicago River: Of the various plans presented all have some measure of merit. But this project cannot be carried out simply as a plan to increase realty east of the river and improve the street system. The importance of a proper terminal location is one of the determining factors as later discussed in connection with alternative plans for a Union Terminal; for it is obviously useless to propose a plan favoring street opening only, if it makes impossible the efficient use of adjacent railroad property.

Straightening the river south of 12th street involves an interchange of area of about 1,115,000 square feet; south of Harrison street 3,200,000 square feet, and south of Van Buren street 5,830,000 square feet. If the interchange values are roughly represented by $5.00 per square foot west of and $10.00 east of the river, the increase due to straightening would approximate from $5,585,000 to $29,150,000 in the three cases. (See Table 1.) It has been frequently stated that the railroads should bear this cost in return for the opportunity to increase the value of their holdings. However, it is a question how much real increment would result from the continued use of this property "for railroad purposes"; and it is certain that such use would probably never develop the land to such an extent as would private occupancy. Consequently, if the railroads are expected to bear this cost, they should be permitted such a development as will enable

them to use the property most efficiently and at the same time fit into a scheme of river straightening and viaduct system. The plans later discussed herein have been prepared with that idea in view—to illustrate some of the possibilities of such development.

The enormous values created by this straightening of the river should be sufficiently attractive to the railroads interested as to fully warrant the execution of the project. Other general advantages would be realized both by the railroad companies and the city. The additional real estate made available by the reclamation of the old river bed would alone amount to from $750,000 to $2,000,000 depending upon the project, which in itself indicates the relatively small cost as compared to the profits to be gained.

SECTION 3.

GROWTH AND FUTURE DEVELOPMENT.

If the problem of the present is serious, what of the future as regards concentration of working population, street traffic, both vehicle and pedestrian, and passenger and freight traffic? The earnings of local transit companies throughout the city indicate an unusually rapid growth in passenger traffic,—over 6 per cent. per year, which growth focuses to a large extent in the downtown district.

Studies by the Chicago Plan Commission have developed the fact that under the existing building ordinances, about 50 per cent. of the available commercial building space between the river and 12th street is now built up and that as some buildings, such as public buildings, banks, theaters, etc., will always remain well under the 16th story limit, that in reality fully 70 per cent. of the available building space is already exhausted, with no opportunity for the expansion of the business district southward.

The seriousness of this condition will be apparent from the

following statement,—that, within the territory bounded by Kinzie street, Clinton street, 16th street, and the lake front, exclusive of water and park areas—

1 The Railroads collectively own or occupy more property in the heart of Chicago than occupied for all public or private business.
2 This area approximates 26,500,000 square feet, half of which, if valued at an average railroad price of $7.50 per square foot, represents an equity in fee simple of $99,375,000.
3 For passenger terminals alone over 1,500,000 square feet of area is occupied representing at least $15,000,000 realty value.

Railroad Traffic: Records of the Chicago passenger terminals indicate a continual growth in the number, size and capacity of trains handled, which, in turn, increases passenger, car and cab traffic on the streets. In the case of the Union Station this increase has amounted to about 35% per decade, *i. e.,* traffic has doubled in about 23 years.

Records of total freight handled by the railroads entering the city indicate a growth of about 55 per cent. per decade within the last 9 years, including the effect of the panic of 1907-8. About one-half of this represents transfer freight, in the case of L. C. L. freight double or triple handled, and shunted across the city largely by teams operating through the city streets.

There are 55 freight houses* in the down town district practically surrounding the "Loop". The situation at 5th avenue and Harrison street is typical. During the busy hour 760 vehicles pass this intersection directly in front of an existing passenger terminal; most of these are freight vehicles. To make matters worse on many of the streets that should be available for trucking, commercial houses fronting thereon utilize a great portion of the street for roadway for their own purposes in handling package freight, for example Franklin street and South Water street.

Street Traffic: Closely related to this matter of building

*See Figure 12—Map of freight houses.

occupancy is that of the source of traffic now using the public streets. This matter has been under investigation by the City Bureau of Efficiency, The Citizens' Street Cleaning Bureau, and the Mounted Police. These investigations, however, have dealt entirely with general vehicle and pedestrian movement without special reference to its relation to railroad operations either freight or passenger. Additional observations have, therefore, been taken with the object of determining what proportion of the vehicle traffic in congested down town streets may be ascribed to railroad occupancy. (Tables 2 and 3.)

Comparative counts taken in 1907 and 1913 at typical congested intersections in the loop district show about 19 per cent. increase in the total vehicles, or over 3 per cent. per year. During this same period there seems to have been a marked increase in the proportion of motor vehicles to team; *e. g.,* on State street there now is 1 motor to 3 teams; in 1907 1 motor to 17 teams. Similarly, on Franklin street there is now 1 motor to 6 teams; in 1907 the ratio was 1 motor to 70 teams. On Van Bureau street under the Union Elevated Loop, the proportion of motors to horse vehicles was 1 to 42 in 1907, and today 1 to 6.

Taking the existing traffic during the business hours throughout the loop district, it appears that Michigan avenue carries an enormous traffic of from 900 to 1150 vehicles per hour throughout its length; nearly the same amount across the Rush street bridge. Similarly, State street, Jackson boulevard, LaSalle street and West Randolph street carry about 900 vehicles per hour. In the railroad district all through streets are loaded very heavily—400 to 500 vehicles per hour.

Coming now to the relation of railroad terminals to street traffic the special counts taken by this office indicate some surprising results. For the maximum rush period, there were found as many as 928 vehicles per hour at Market and Madison streets. These streets are both 80 feet in width. In the freight house district there were found 760 vehicles per hour

at Harrison street and Fifth avenue, a 66 x 80 ft. intersection. At Polk and LaSalle streets, a 40 ft. intersection, there were found 679 vehicles, practically all freight vehicles. (See Table 3.)

In order to secure even more definite results the counts were taken at certain freight pockets, *i. e.*, the streets which are practically given over to freight house service, were observed. Approximating all these locations, it may be said that from 25 to 100 per cent. of the vehicles to be found on the street in the vicinity of railroad property are used in connection with railroad transportation—very largely for freight, averaging practically 50 per cent., *i. e.,* half of the down town street facilities are used in connection with or for railroad purposes and half for private business.

Further, mere numbers do not convey an entirely correct conception of street occupancy owing to the very great difference between slow freight vehicles and rapidly moving passenger vehicles such as are largely used in the retail district, *i. e.,* for the same car mileage slow freight vehicles require easily twice the street facilities as rapid passenger vehicles. This point of view emphasizes two important facts:

1 The railroad terminal business now requires a far greater proportion of the down town street facilities than is justifiable from the point of view of an open city thoroughfare.

2 In any terminal re-arrangement it is absolutely essential that new streets be cut through and present streets be widened to the maximum possible extent.

Even though additional north and south thoroughfares are created, their capacity will be greatly reduced unless the river is straightened and the throat opened.

That this demand is not overdrawn will be developed later in showing the growth of freight business which has averaged about 55 per cent. per decade in Chicago terminal district for the past few years, largely centering in the down town terminals.

A further and most serious phase of this subject is the fact

that street congestion due to freight vehicles reaches a maximum at about the same time of day that the rush or passenger traffic homeward bound begins. Fig. 2 shows a typical

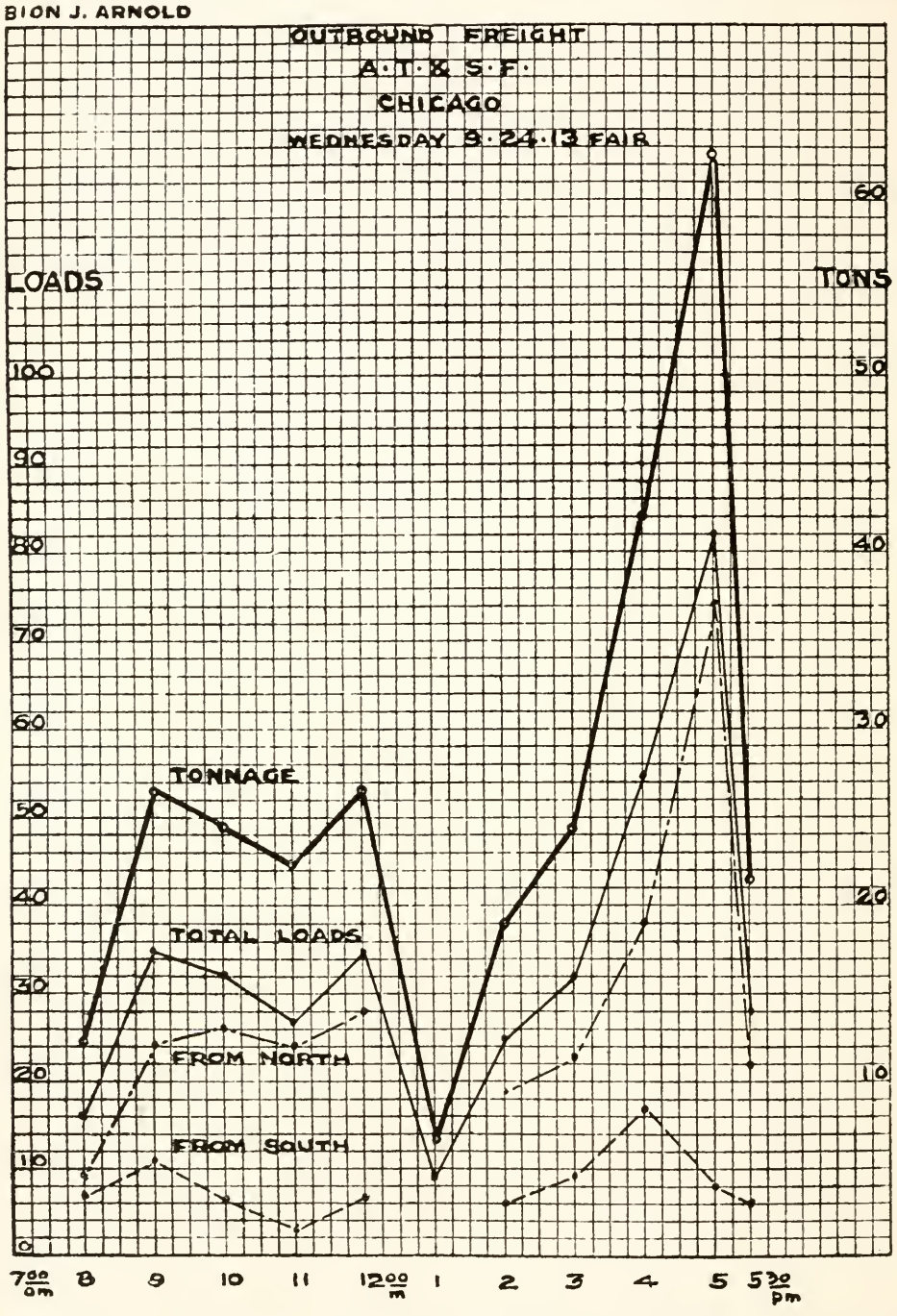

FIGURE 2. HOURLY OUT-BOUND FREIGHT RECEIVED—SANTA FE

Diagram showing the total traffic to out-bound houses throughout the day. The peak in traffic occurring at about 5 P. M. indicates the congestion at the freight houses as well as on all tributary thoroughfares at that time.

load curve at an outbound freight station. Properly, the outbound peak should occur earlier in the day, *i. e.*, 1 to 3 P. M., but owing to the great bulk of late consignments the peak actually occurs at 5 P. M. In the morning practically the same conditions obtain, with the peak of the inbound freight load occurring from 8 to 9 o'clock, at the time of maximum car and passenger traffic. However, the morning traffic, both passenger and freight, shows a lower maximum than in the evening and distributed over a longer period. This fact that approximately 50 per cent. of the total outbound freight is not delivered after 3 P. M., emphasizes the need of corrective measures, in which the co-operation of shippers is essential to encourage earlier delivery.

A graphic record of the street vehicle congestion which occurs in front of one of the passenger stations in Chicago is afforded by Fig. 3, giving the result of a count at the Grand Central Station. When it is considered that from one-third to one-half of the vehicles here encountered are going directly to or from freight houses, it is clear that the advantages of the best possible location of a passenger station from a railroad standpoint, may be completely nullified by this freight congestion, and this fact should be held in mind in all discussions of passenger or freight terminals.

Provision for Future Growth: The only remedies for these conditions are more efficient methods in transportation and freight handling, together with liberal street improvement and more rigid police regulation. Only thus will it be possible to keep pace with the steady growth in population and commerce. At the present time Chicago is increasing about 53,000 persons per year, or at a rate of about 2.25 per cent. compounded, and according to approximate estimates based upon the most reliable data available, the growth for Chicago will be about as follows:

Population will probably double in about 34 years.

Train mileage will probably double in about 23 years.*

Street car traffic will probably double in about 15 years.

*Applying to Chicago the law of growth for the entire country, i. e., normal growth, excluding financial depressions.

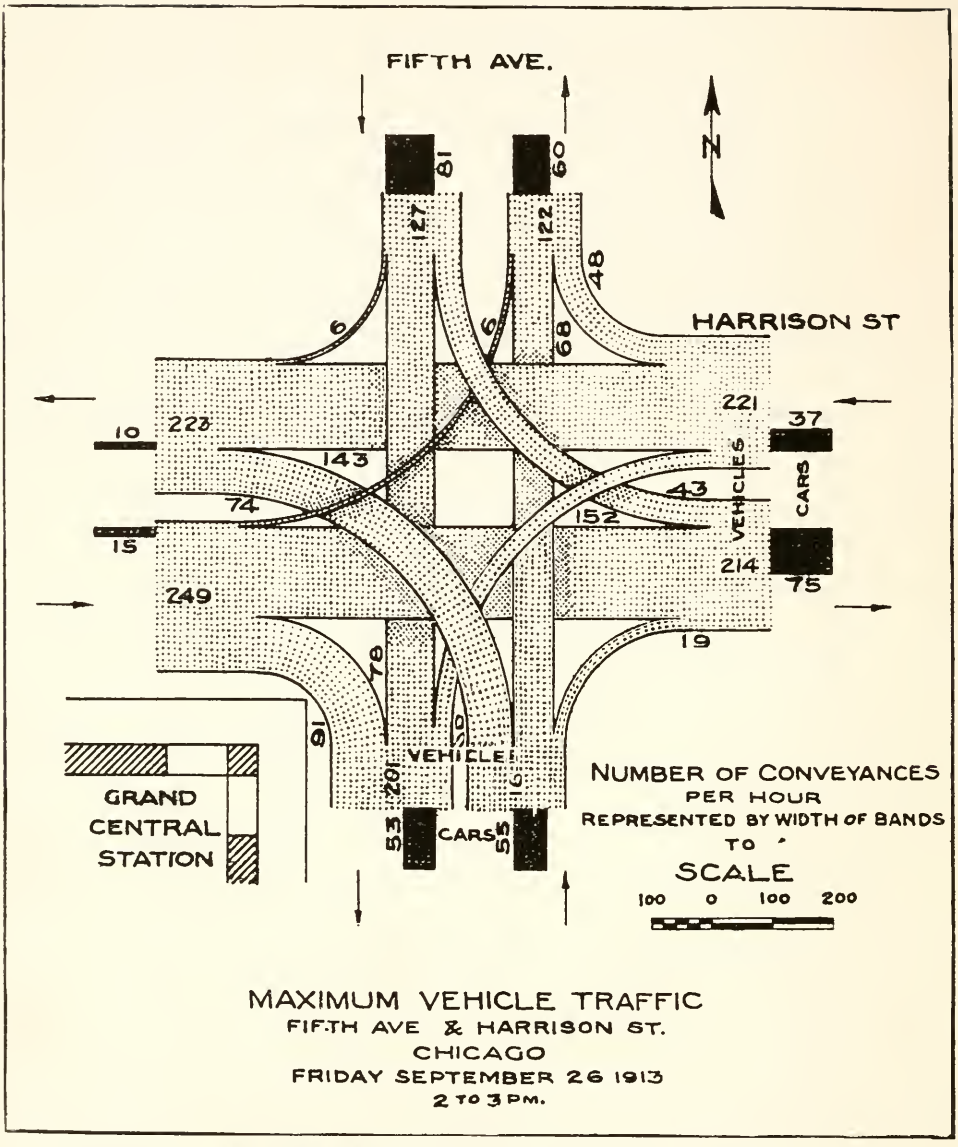

FIGURE 3. MAXIMUM VEHICLE TRAFFIC—FIFTH AVENUE AND HARRISON STREET.

Diagram showing the direction and magnitude of maximum vehicle and car traffic at the intersection of 5th Avenue and Harrison Street. Of the total vehicles, over 750 per hour, nearly 95 per cent. consists of freight vehicles, illustrating the congestion resulting from a limited number of approach streets to freight houses and team tracks. The severe grades on Polk and Taylor Streets, diverting possibly 150 vehicles per hour to the low grade route via 5th Avenue and Harrison Street, tends to increase this congestion.

Railroad passenger traffic will probably double in about 13 years.*

Railroad freight traffic will probably double in about 11 years.*

*Applying to Chicago, the law of growth for the entire country, i. e., normal growth, excluding financial depressions.

It now remains to consider these rates of growth with reference to the terminal situation of Chicago. The questions to be answered are as follows:

1 How much margin in train capacity is now available in the various types of stations over and above present maximum rush hour traffic?

2 How rapidly will this margin of capacity be absorbed by future growth of two or three decades?

It is to be assumed that Chicago will not lag behind the country as a whole in either passenger or freight traffic, and as the average length of train haul presumably varies but little except with a large increase in territory served, the trains actually operated into Chicago stations may roughly be assumed to increase at about the same rate as the train mileage. Obviously the trend of suburban growth will have an important bearing upon the facilities to be provided, irrespective of long distance traffic. This suburban business would without doubt respond quickly to electrification even though the through business maintained normal growth.

Basis of Future Estimate*: Due to its geographical position Chicago has become the most important transfer point of the country; consequently its train traffic, especially for through trains, will be influenced largely by the growth of the country as a whole rather than by the growth of the city. On the other hand, suburban traffic will depend entirely upon the growth of the Chicago District including distant suburbs.

The most effective method of analyzing this growth is to compare passenger traffic and train mileage with population. Taking the country as a whole, the population of the United States has increased since 1870 at an average rate of 24 per cent. per decade. In accordance with the known law of normal growth, the rate of increase has become less and less during the succeeding decades—30 per cent. 1870 to 1880 and 21 per cent. 1900 to 1910. In estimates for the future, this rate of increase has been conservatively reduced each

*See Table 22 for comparison of traffic of U. S. and the North Central group of states.

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succeeding decade, resulting in an estimated rate of increase of between 19 and 15 per cent. for each decade up to 1940.

The North Central States, principally comprising Ohio, Minnesota, Indiana, Michigan, Wisconsin and including the City of Chicago have shown an almost constant increment of population in each decade of the last 40 years. Therefore the same rate is assumed as a basis of estimating future growth for a period of at least two or three decades.

The results for the country as a whole and the North Central States in particular, indicate that the underlying growth of population is generally consistent and constitutes a reasonably sound basis of prediction for Chicago, whose traffic is unusually representative of the country as a whole.

Train Mileage: A consistent increase in train mileage operated in the United States occurred from 1890 to 1910, with the exception of the period of financial depression from 1893 to 1896. Neglecting the effect of this depression a statistical analysis of the available data shows the remarkable fact that:

> Train mileage of the United States has increased within the past two decades approximately as the *square* of the population, *i. e.*, as the population doubled the operated mileage has quadrupled.

The above law may be regarded as expressing normal growth only during fairly prosperous times, since the effect of abnormal influences, such as continued financial depressions, can not be foreseen or estimated.

Applying the same analysis to the North Central group of states surrounding the Chicago District, it appears that the train mileage operated has increased at least as the square of the population of these states, which corresponds approximately with that of the tributary population along the lines investigated. Applying this law to the future, the following growth in train mileage may be expected:

COMPARATIVE GROWTH OF TRAIN MILEAGE.

UNITED STATES AND NORTH CENTRAL STATES.

TRAIN MILEAGE.

Decade.	Increase for decade.			Total increase since 1910.		
	U. S. A. %	North Central States—%	Average %	U. S. A. %	North Central %	Average %
1890 to 1900	20	24	22	..	..	..
to 1910	50	40	45	..	..	..
to 1920	38	36	37	38	36	37
to 1930	38	29	33	91	77	82
to 1940	33	29	31	154	128	138

Since train mileage will be nearly proportional to trains operated, the above figures for increase in mileage represent approximately a measure of the increase in train handling capacity in and out of Chicago which must be provided for in computing the future station capacity required. This assumption is more or less borne out by the fact that there was from 30 to 35 per cent. increase in trains operated in and out of Chicago for the last decade (1900 to 1910). For the whole country, train mileage increased 50 per cent. and for the North Central states 40 per cent.

Passengers Carried: A similar analysis of the records of passenger traffic indicates that for the entire United States:

> The traffic has been increasing approximately as the *cube* of the population (neglecting the depression of 1893 to '95).

For the North Central states it appears that the passenger traffic is increasing at about the same rate as for the entire country. On this basis a very approximate prediction for the future may be made:

PREDICTED GROWTH IN PASSENGER TRAFFIC.

	Increase per Decade.	Total Increase Since 1910.
1910 to 1920	65%	65%
1920 to 1930	60%	164%
1930 to 1940	56%	307%

COMPARATIVE GROWTH OF STEAM RAILROAD TRAFFIC.

UNITED STATES AND NORTH CENTRAL STATES.

Train Mileage Operated				Passenger Travel† United States.	
U. S.		North Central States			
Year	Amount	Year	Amount	Year	Amount
1889	277,000,000	1887	90,000,000	1881	241,000,000
*Doubled in		Doubled in		*Doubled in	
1910	549,000,000	1910	180,000,000	1897	489,000,000
Should double in		Should double in		Doubled in	
1931	1,098,000,000	1935	360,000,000	1910	972,000,000
				Should double in	
				1924	1,944,000,000

*NOTE: Financial panic included in this period.

†This total travel includes all interchange passengers traffic between roads as two or more rides similar to transfer passengers in street railway traffic.

Authority: Compiled from I. S. C. C. Reports.

Of incidental interest is the fact that the average loading per train has steadily increased from 39 to 57 passengers per train during the period 1896 to 1910, or a yearly increment amounting to 2.6 per cent. (of the year 1910 loading). Further, the average length of passenger haul has increased uniformly by about 1.7 per cent. (of that for 1910).

Freight Traffic: Similarly, an analysis applied to total tonnage of freight handled throughout the United States indicates:

> That the freight traffic is increasing as the *fourth* power of the population, and with even a higher rate for the North Central states. This means that a doubling in freight business will result from an increase of about 20 per cent. in population.

All of the above analysis points unmistakably to the great need of foresight in planning facilities for the future, both passenger and freight, and especially the latter.

Capacity of Chicago Stations: Applying the methods of analysis described elsewhere (Section 7), it is found that under the existing relations of through and suburban service, there are required for Chicago at the present time stub terminal facilities approximately as follows (excluding Illinois Central suburbans):

Through service, 24 tracks
Suburban service. 17 tracks.....41 tracks total.

This assumes all of the terminals operated as a unit and up to the maximum capacity during the rush hour. This demand corresponds to 109 trains per hour, 47 per cent. more than the maximum train movement of both stations in New York City and 65 per cent. of that at the North and South stations in Boston combined. Citing some of these American stations for the maximum rush hour:

Chicago, 6 stations,	109 trains per hour—	61 tracks
Grand Central Station, New York City,	43 trains per hour—	42 tracks
Pennsylvania Station, New York City,	35 trains per hour—	21 tracks
Total, New York City—	78 trains—	63 tracks.
D. L. & W., Hoboken,	29 trains per hour—	14 tracks
Broad St., Philadelphia,	48 trains per hour—	16 tracks
South Station, Boston,	88 trains per hour—	28 tracks
North Station, Boston,	78 trains per hour—	24 tracks
Total, Boston—	166 trains—	52 tracks.

In Chicago the proportion of mid-day business to rush hour business is small, so that to accommodate rush hour traffic it is necessary to provide terminal facilities which will lie idle to a great extent during mid-day. This condition is very marked in Chicago, where mid-day (9 A. M. to 5 P. M.) traffic averages about 40 per cent. of the rush hour business, as compared with slightly over 60 per cent. in the Broad street (Philadelphia) station and the Pensylvania Terminal in New York. Reference to the load curve, Figure 4, shows that the excessive rush hour peak is caused to a great extent by the suburban traffic. This points to the fact *that suburban should be separated from through traffic to avoid the construction of elaborate and expensive terminals to care for large suburban peak loads.*

The above statement in station requirements for present Chicago traffic represents the *minimum,* for, in a single union station, the maximum load of the various contributing roads would not occur at quite the same time, and, therefore, the station capacity could be used to better advantage than if each group of roads handled their individual peaks in separate stations as at present. Adding an arbitrary 25 per cent. on this account, it appears that 28 stub tracks are required for pres-

Note: Table 4 shows this composite rush hour traffic for independent stations.

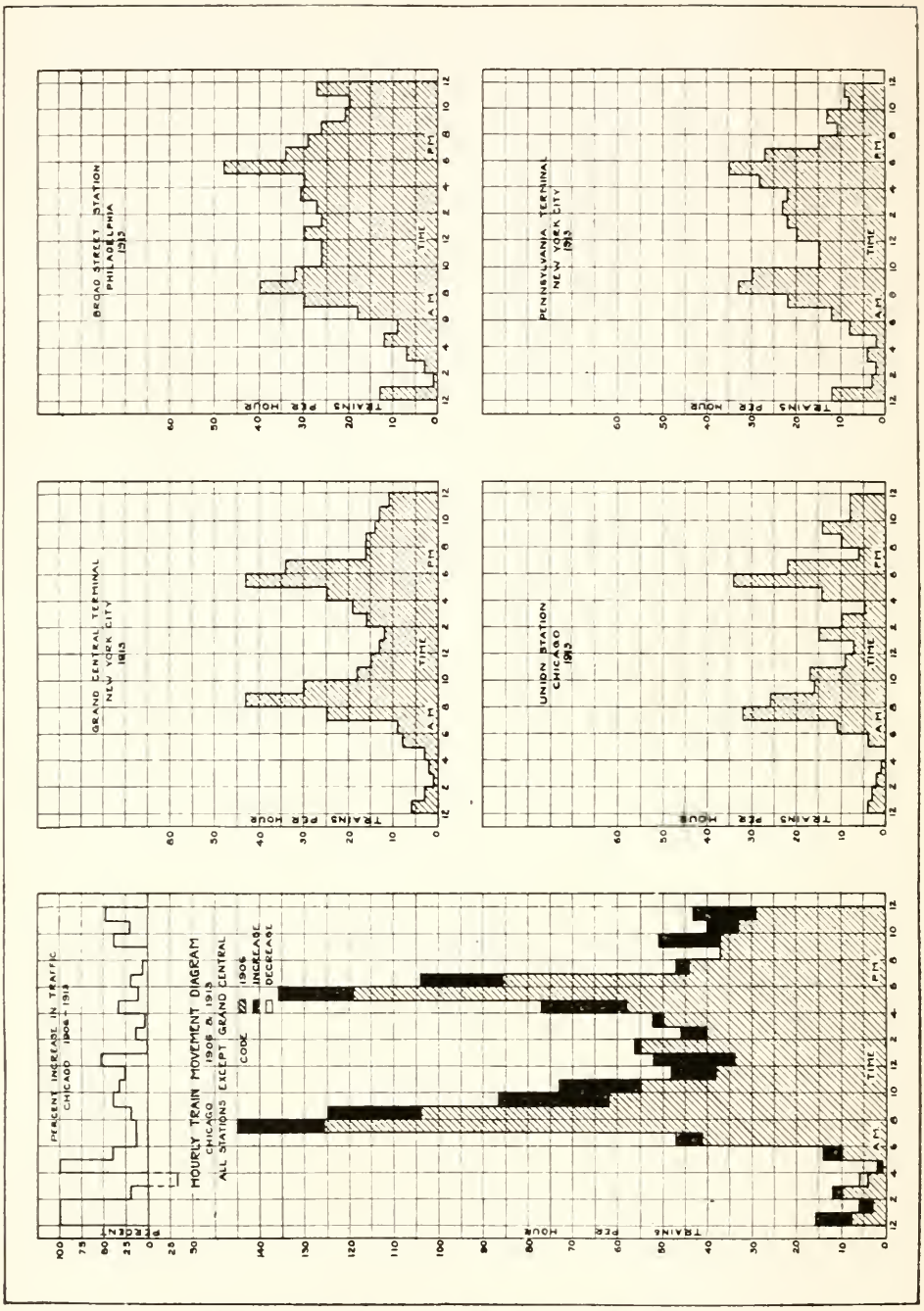

FIGURE 4. COMPARATIVE TRAIN MOVEMENT—ALL CHICAGO STATIONS AND LARGE STATIONS IN OTHER CITIES.

Hourly train movement diagrams for Chicago (excepting Grand Central Station, which handles little traffic and for which no information was available for 1906, hence omitted) and several large terminals in other cities. Solid black on the Chicago diagram indicates growth in traffic between 1906 and 1913. The difference in volume of traffic handled in Chicago and that in any of the single stations shown indicates the enormous size of a single Union Station that would be required to handle all Chicago traffic. Peak loads in Chicago are unusually severe, there being comparatively less midday traffic than in the Pennsylvania terminal, New York, and the Broad Street Station, Philadelphia.

ent Chicago traffic through business and 22 tracks for suburban business, a total of 50 tracks. This appears to indicate that the present stations in Chicago are within 11 tracks of their ultimate maximum capacity.

A detailed survey of these stations under their present method of operation indicates that this is not far from the fact. The Union Station, Illinois Central Station and the Dearborn Station have admittedly reached their capacity. The B. & O. Station has a large surplus over its present traffic. The La Salle Street Station, while even now congested at times, would have a margin of from 3 to 4 tracks if the main approach tracks were left free from switching operations, and all trains were made up complete at the coach yard. However, with any considerable increase in suburban business, the station must soon be cramped, or the suburban business diverted to some other station. Similarly, the North Western Station while now having a margin of perhaps 5 tracks during the maximum period will probably find this capacity taken up in the near future by a large increase in suburban business, and thus the large investment in the station which ought to be reserved for long distance business will be hampered by excessive suburban movement.

Thus, of all the large stations in Chicago, the North Western and La Salle are *alone* fitted for future service to any considerable degree, and it is upon this premise,—that largely increased capacity is now or will soon be absolutely necessary,—that the recommendations of this report are made, and a more logical regrouping of entrance routes and rearrangement of terminal facilities proposed. Furthermore, the proposed segregation of suburban from long distance traffic is based upon a condition in local transportation which eventually cannot be avoided, whether the suburban business pays or not. That is, the railroads should not be called upon or *allow themselves to build expensive terminals in which suburban business will soon crowd out the legitimate long distance* business for which such terminals are best adapted.

Terminal Consolidation: It is impossible and unnecessary to apply this theory of growth to the individual stations in Chicago by reason of the important effect which peculiarities of operation, location and grouping of roads have upon their ultimate possibilities. But the analysis may be applied direct to a *hypothetical Union Station,* and in so doing arrive at a fair idea of the results of consolidation. Assume, for example, the entire passenger business, both through and suburban, consolidated into one terminal located south of 12th street, as proposed by Mr. Hunt. The 100 tracks available in his plan would probably provide sufficient capacity with single berth operation to last for perhaps 12 years; and if the suburban business were separated, there probably would be sufficient capacity for nearly 40 years.

But, in the meantime, the business district would have expanded southward and completely surrounded, as far as possible, this Union Station, when there would result the identical opposing forces as exist today, viz.: railroad *expansion* and business *compression.* Therefore, the site of this hypothetical Union Station, in spite of the unquestioned train capacity of the station, is not believed to be such that possible future conflicts between city and companies, such as now exist, may be as readily avoided as a site which would offer less obstruction to the expansion of the business district southward.

If it were deemed advisable to construct such a Union Terminal, it would seem better to locate it on the site of the present Illinois Central Station at 12th street. This location would not only eliminate entirely the above objections of obstructing the business district in its expansion to the southward but would also place it in an ideal location both from a railroad and aesthetic point of view; for in this location all passengers coming into the city would land by the lake side.

The contract recently consummated between the South Park Commission and the Illinois Central Railroad provides sufficient area to enable the construction of a station of about 60

tracks, which, considering both through and suburban business, would give sufficient capacity to last for about 18 to 20 years for all traffic except the North Western through and suburban and Illinois Central suburban; or considering all through business (except the North Western), to last for about 30 to 35 years.

This station, while having the advantage of being located in such a manner as not to obstruct the development of the business district, is more or less inaccessible for all Northwestern roads. Furthermore, the great size of station required to meet the future needs of the entire city, and the concentration of traffic resulting from the use of a single station, seem to militate against, not only this site, but also against the adoption of but one station for a city the size of Chicago. It might be argued that Mr. Hunt's location of this station would make it more accessible owing to the greater number of approach streets reaching it, which statement in itself is, of course, true. But the station if located on the Illinois Central site could be made sufficiently accessible by the construction of suitable subways and surface lines. With this added transportation service by subways and surface lines, and in addition the facilities offered to vehicles by providing a plaza between Michigan Avenue and Indiana avenue, extending from 12th to 14th street, the combined facilities of the lake front site are evidently superior to those of the Hunt site further west. In addition, it offers no obstruction to the expansion of the business district southward, even when developed to its fullest capacity and is free from the objection of having any of its approach tracks subject to interference by a river bridge.

Partial Consolidation: If, on the other hand, a plan is evolved distributing to some extent the passenger business between such sites as afford some room for future expansion, it is believed that the public will, in the end, be better served. Thus, keeping the North Western station for through business only, establishing a West Side Union Station along Canal street, for Western roads, and developing the Illinois Central

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Station for Eastern, Southern and Southwestern roads, this grouping, when taken in connection with a through routed suburban train service with interchange coach yards, would insure greater flexibility to meet future demands than any conceivable single union station site could afford.

By this method the fundamental principle with reference to location of railway terminals laid down in the original Chicago Plan is conserved by means of which there is established a series of terminals westward of and approximately parallel to the Chicago river. This location being low, forms a natural site for such terminals, as it enables the tracks serving them to be kept sufficiently low to allow the streets to pass over them, and so arranges them that the through route principle from station to station can be adopted for the eventual accommodation of suburban passengers.

By this means suburban trains may be run from the right of way of one railway company to that of another, through these stations, for the serving of passengers within the Chicago district, and their best distribution down town. Further, these through tracks can be used as interchange tracks between the various passenger terminals for the rapid through routing of through trains between roads, should this ever become advisable.

SECTION 4.

RAPID TRANSIT DEVELOPMENT.

It is apparent from a study of various terminal proposals that adequate rapid transit service has not been given the consideration which it deserves, both as relates to street car service on the city streets and to rapid transit on private rights-of-way. And herein lies a serious defect that should be corrected. A fundamental necessity in the event of the removal of present terminal facilities to a more distant point such as 12th street, is that frequent, convenient and rapid car

service be available reaching all parts of the city either by direct routes or by a single transfer. If any great amount of suburban service is expected to be handled at such a distant point, this necessity becomes the more pressing; for commuters cannot afford taxi cab rates daily. With long distance passengers the necessity of intimate contact between railroads and transit lines is less important but nevertheless is a great factor in the success of any plan proposing an expansion of the business district.

Street Cars: The principle of through routing of cars past or underneath the proposed stations becomes more and more important as the size of the station increases. At any point where cars stop and reverse their direction, either by means of a loop or stub terminal, traffic unavoidably focuses in the rush periods of the day. This condition sooner or later demands revision, often at far greater expense than if adequate provision had been foreseen and such conditions avoided, for example the Brooklyn Bridge Manhattan Terminal.

At the present time three extremely important movements are under way for improving transit service in Chicago, as follows:

1—Through routes and platform extension on the Union Loop terminal embracing all elevated lines in the city.

2—Operating consolidation of the surface car lines in the city with the establishment of complete through route service through the business district as well as between the north and south sections of the city now occupied by competing lines.

3—Initial subway construction in the down town district with the possibility of a more comprehensive system, both embodying the principle of through routes.

This general recognition of the through route principle in promoting the most effective inter-communication is of the greatest importance and the same principle should be applied to railroad terminal operation so far as practicable, with the same object in view.

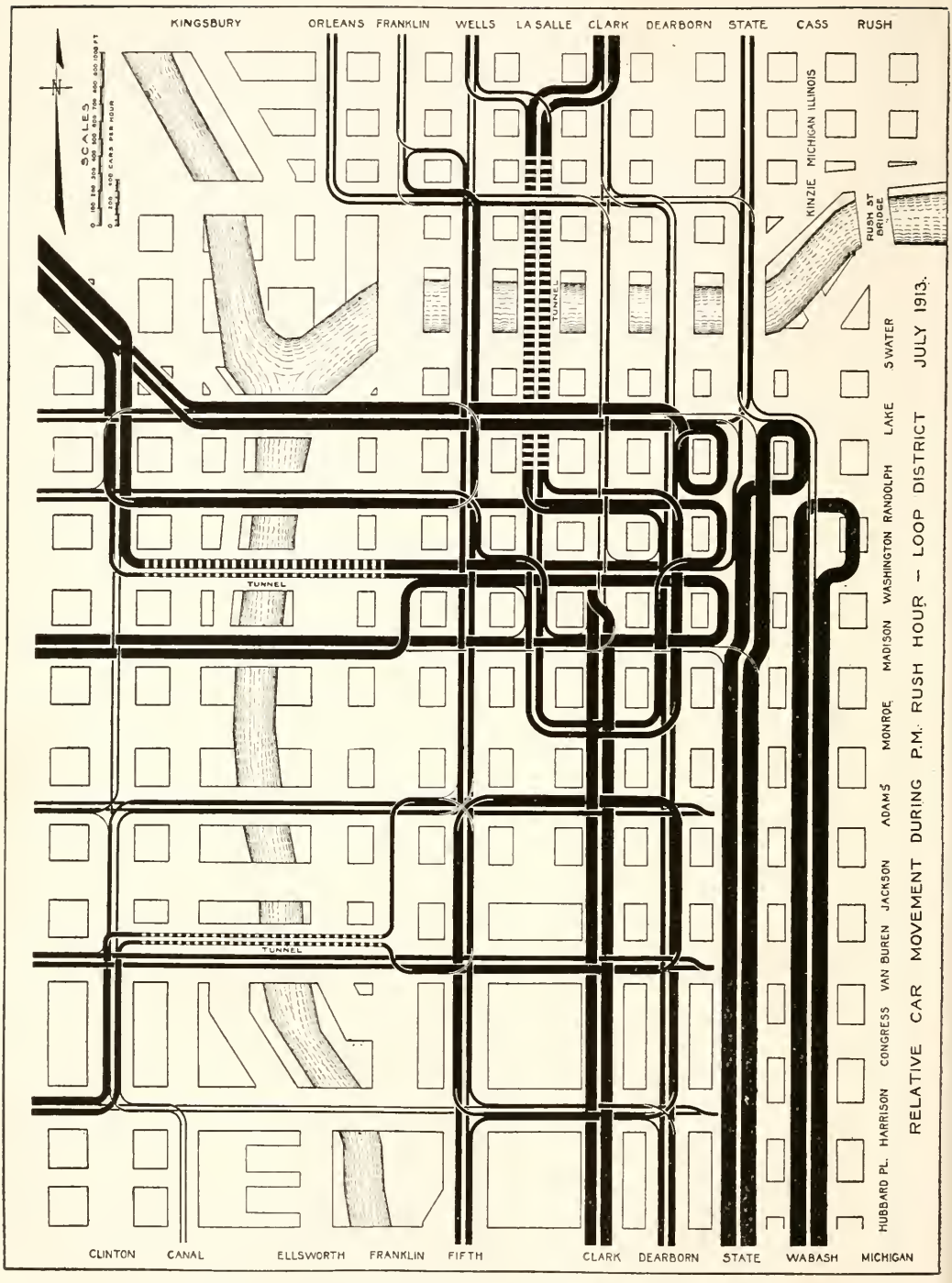

FIGURE 5. STREET CAR FLOW DIAGRAM.

This diagram, taken from the annual report of the Board of Supervising Engineers, Chicago Traction, shows the street car movement over various streets in the congested district during the rush hour. Note the forced concentration of traffic on the available thoroughfares, particularly toward the south and west, which is rapidly approaching a point where additional outlets from the business district will be absolutely necessary. Fortunately the passage of the recent unification ordinance by the Chicago City Council will facilitate the through routing of cars and greatly help the situation.

Rapid Transit Lines: There are at the present time through and suburban trains moving in and out of Chicago during the busy hour handling 34,000 passengers. During the day approximately 1400 steam railroad passenger trains move within the terminal district aggregating a total passenger traffic of 193,000 passengers per day. It is evident that adequate provision must be made for this traffic other than can possibly be offered by street car lines, especially under present conditions of street congestion and it is for this reason that the most intimate possible contact between railroad terminal and rapid transit facilities should be provided, especially in the case of a single Union Station located perhaps one mile from the business center.

On the other hand the relative traffic contributed by the railroad terminals as compared with that handled by street car lines has usually been greatly exaggerated. The surface car lines alone, transport from 80,000 to 100,000 passengers during the evening rush hour out of the down town business district. The elevated lines transport 63,000 more. Against this, the total in and out flow of long distance railroad passengers aggregates not more than 7,000 per hour at the present time. Thus assuming the separate handling of through and suburban passengers it is apparent that terminal plans are not as greatly dependent upon special transit facilities as is thought by some, provided there is adequate provision for suburban traffic which represents a large percentage of the total, thus:

Street railway passengers.....	1,000,000,000 per year
Elevated railway passengers.....	164,000,000 per year
Suburban steam passengers.....	41,500,000 per year
Long distance steam passengers*.	24,000,000 per year

In this terminal study railroad suburban traffic has been brought as close as possible to the business district irrespective of the terminal location so as to provide maximum convenience to commuters without extra fare; and in addition, ade-

*Estimated.

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quate service and rapid transit lines for the terminals are considered, so located as to properly fit in with the general plan of rapid transit development executed step by step according to the demands of the expanded business district.

Effect of loop operation: The results of the operation of the Union Elevated Loop upon the commercial development of the down town district should not be lost sight of at this time, and in considering the possibilities of a suburban circuit surrounding the business district, the lessons of the past have been applied. In 1893 all elevated lines terminated in stub stations located at the out-skirts of the down town district. Later the Union Elevated Loop connected all these lines by a circuit seven blocks long by five blocks wide. Although heralded at the time as an ideal solution, time has proved the necessity for its removal or modification so as to eliminate the looping feature at an early date, as soon as adequate subway facilities now under consideration are provided. In fact, through routing on the elevated railway lines over the Union Loop has just been put into effect. A fixed loop has been found to operate as an impenetrable wall preventing the greatly needed expansion of the business district beyond the physical boundaries of the loop. First class realty development has found the outside territory practically untenable. Values inside have been kept at fictitiously high levels, street and car congestion have greatly increased as a result; and at the same time restrictive building laws have been imposed by the city limiting the height to 16 stories. This limitation, however, seems reasonable until the business district can be made more accessible by the opening of streets and the construction of more bridges leading to it. As noted previously approximately 70 per cent. of the ultimate floor capacity of the loop district is already used up and it is evident that a change must come.

Suburban Loop: The establishment of a similar form of loop for suburban trains has been proposed, to bear a similar

relation to the steam railroads, that the Union Elevated Loop does to the elevated roads. But while it would undoubtedly be convenient to thus provide access from any suburb to all sides of the down town business district, the same undesirable results would be sure to follow as in the case of the Union Loop. Such a plan could only be tolerated at this time under the following conditions:

1—That it be located far enough from the center of the business district to provide for the necessary expansion for many years to come.

2—That instead of individual loops, the through route plan be employed precisely as now practiced by both elevated and surface traction lines, and proposed for subway systems.

On this plan of through operation the so called "loop" resolves itself into a collecting and distributing system of tracks and stations east, north and west of the present business district. It thus in effect straddles the district but in a manner allowing for its expansion, encouraging progress northerly and southerly as well as westerly. This is the primary object. The danger is in locating this loop too close in, *i. e.,* so close as to restrict rather than to enlarge the district. It will be seen in Section 10 that the system suggested not only straddles but also bisects the business district.

It is believed to be a mistaken object to establish this suburban right-of-way for the primary purpose of inter-communication between stations. For this is obviously the function of the rapid transit and surface lines, although such connections for passengers, mail, baggage and express could be made by means of the suburban system outlined. With stations of the rapid transit type distributed around this suburban route, it is evident that the maximum convenience will be provided to passengers in connection with the great underlying net-work of city transit lines which have and will further be laid out with reference to maximum convenience to inter-change passengers. These rapid transit lines should

and undoubtedly will, if properly laid out, permit any arriving passenger to reach any other station by rail with convenient transfer between car or subway lines without the necessity of walking or hiring a cab. With this object accomplished there is no necessity for incurring the large expense of loop or shuttle operation of trains on the suburban circuit for transfer purposes only.

The present railroad situation of Chicago as regards distribution of suburban traffic between roads, practically requires the interchange of coach yard facilities in order to carry out the through routing principle. The details of this plan are presented elsewhere and it is sufficient to note here that while the through operation of all suburban trains from north suburbs to south suburbs would be ideal it is impracticable for the present on account of the unbalanced traffic, but with interchange coach yards it is perfectly feasible for south side service to lap over into the north territory and vice versa, thus providing convenient access to any part of the central business district.

Rapid Transit over Railroad Lines: The existence of so many parallel and radial steam lines entering Chicago from all directions (some directly as the result of competition), and the possible consolidation of passenger service over some of these lines brought about by the unification of terminal facilities, immediately suggests the possible use of some of these lines, thus released, for rapid transit suburban purposes. While the present elevated railway electric service covers part of the city, other parts are distinctly handicapped by lack of fast service, especially the distant suburbs. With the building of subways, now imminent, the usefulness of all these lines will be greatly enhanced if electric service should be extended into the distant suburbs. Until complete electrification of steam suburban lines takes place, this plan is entirely logical, resulting from the fact that Chicago has grown too large for efficient street car service from the center of the city to its

suburbs. Numerous points of junction exist at present throughout the city where such connection between elevated or subway, and railroad lines can be made to advantage and as the rapid transit system grows, both elevated and subway, other points will develop.

In the application of this principle there will likely develop a logical limit where profitable electric suburban traffic should cease and long haul suburban railroad traffic begin. Thus, the down town railroad terminal will be relieved of the congestion of comparatively short haul suburban traffic, which can best be handled by the frequent electric service providing quick and direct access to the heart of the business district. Here again the surface railway system will be practically relieved of the burden of long haul, and operate in its proper function as a short haul distributing system giving frequent headway and maximum convenience.

SECTION 5.

ORGANIZATION OF FREIGHT HANDLING FACILITIES.

In order to make clear the suggestions arrived at and discussed and proposed in this report, it is necessary at this point to review briefly present methods of freight handling, 1st, in the downtown district, and 2nd, in the "Chicago Switching District."

Present Scheme of Organization: Chicago freight business consists of two general kinds, first, through, and second, Chicago destination or origin; this applies to both carload (C. L.) and less than carload (L. C. L.) freight. At the present time inbound trains arrive at the various break-up yards in the outer city where cars are classified, the transfers being sent to the nearest junction with the forwarding road to be carried to destination. Many of these junctions where interchange deliveries are now made are close to the business dis-

trict. For example, the connections in the vicinity of Clark and 16th streets.

Similarly, L. C. L. interchange freight between roads, for lack of better facilities, is carried to the various downtown terminals where space must be provided for classification and transfer to receiving company's station by teams, by Chicago Tunnel, or by cars.

The accompanying diagrams, Figs. 6 and 8, have been prepared to show the present distribution of total freight car movement entering Chicago as between city terminal deliveries proper and that freight which is interchanged between roads in the city proper, destined for points outside and which latter should be entirely removed to a convenient outlying clearing point. Practically one-half of Chicago's *total* inbound business is sent to connecting lines to be forwarded to other cities. About 70 per cent. of this one-half is brought into

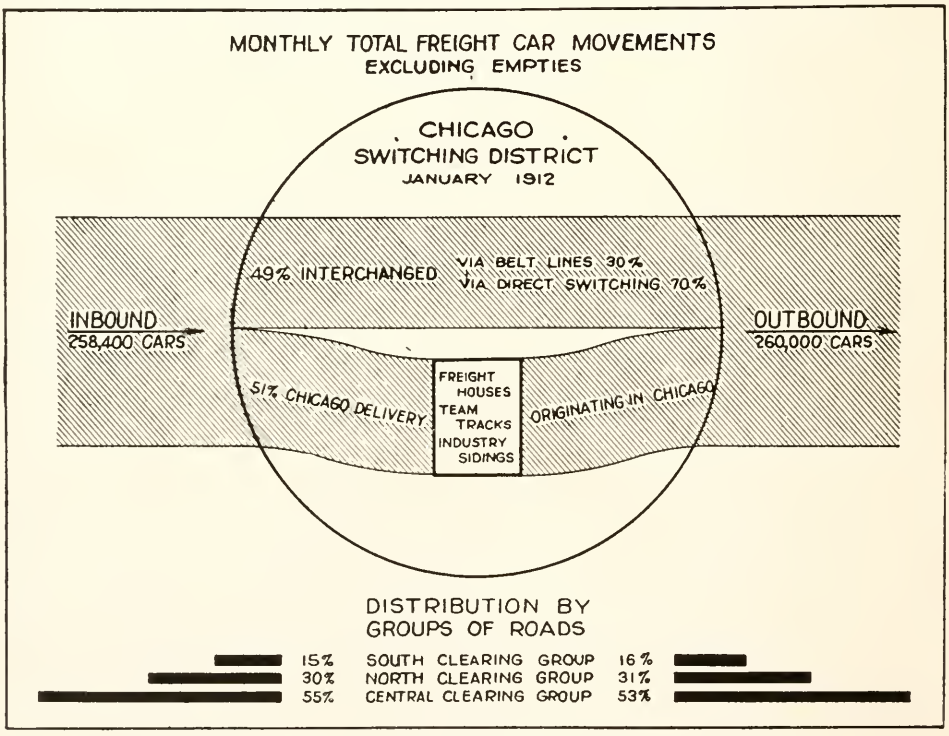

FIGURE 6. LOADED FREIGHT CAR MOVEMENT.

Showing graphically the proportion of in-bound and out-bound freight, 49% of which is interchanged between roads. Note the fact that, of the total freight interchanged, 70% is handled by direct switching within the city limits.

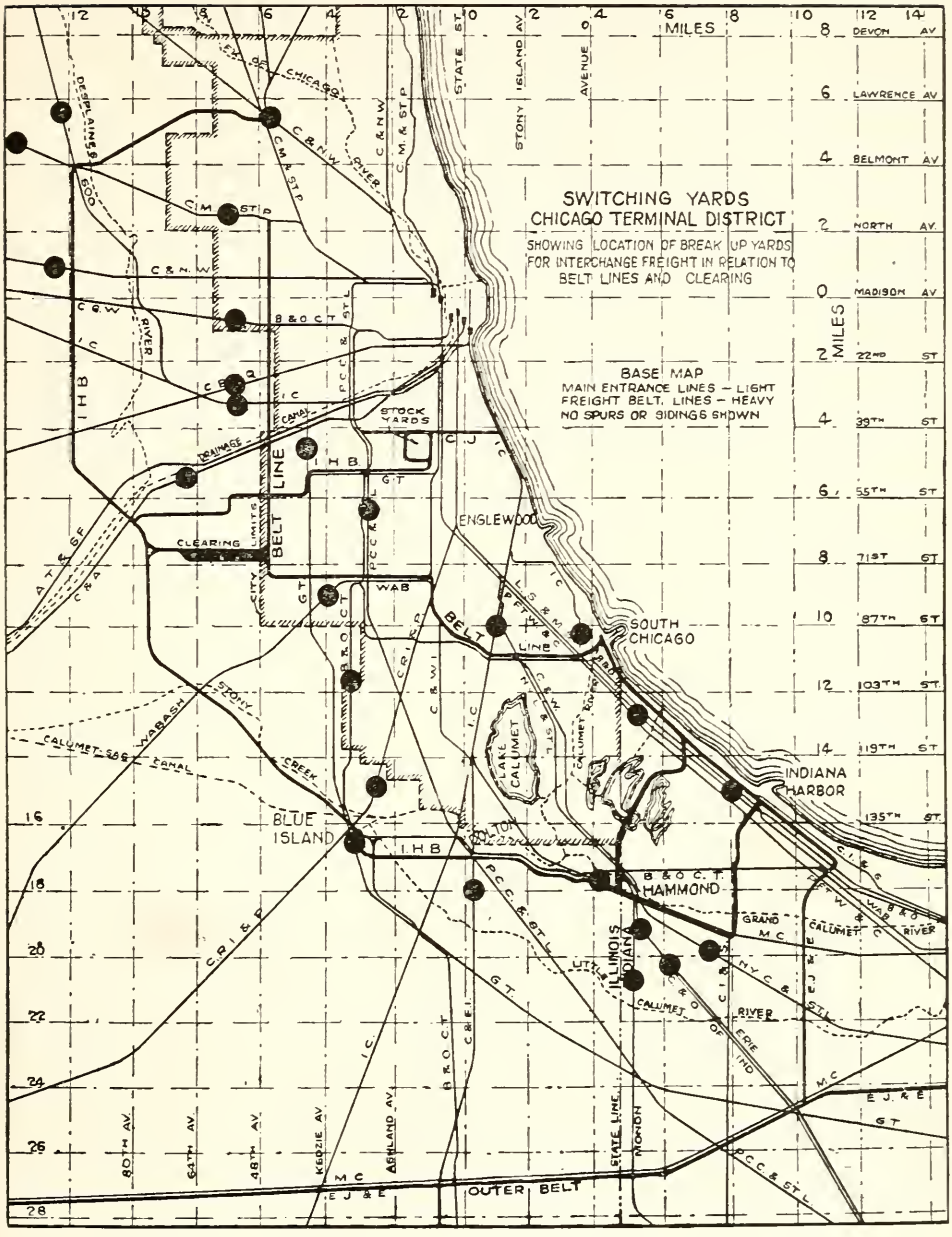

FIGURE 7. BREAK-UP YARDS, CHICAGO SWITCHING DISTRICT.

Map showing the location of the break-up or receiving freight yards of the various railroads entering Chicago. The location of many of these yards inside of the belt lines tends toward congestion and the handling of much interchange freight within Chicago which, inasmuch as it is destined for other points than Chicago, should be kept outside and interchanged over the belt lines.

the downtown district and there switched between lines; 30 per cent. being handled by the belt lines outside. The other half of the inbound business, is legitimate Chicago delivery and

comes into the city to freight houses, team tracks and industry sidings; a considerable proportion of it reaches the downtown district.

Figure 8 shows the amount of package freight brought into the city, about 40 per cent. of which is consigned for Chicago delivery, while about 60 per cent. is destined for points beyond. Strictly speaking, through freight, either C. L. or L. C. L. should not be handled within the city's congested districts. There are very urgent reasons for excluding from the downtown district particularly, all interchange L. C. L. freight, *i. e.*, freight that passes through the city destined for points beyond, which amounts to about 6,600 tons per day. Of this interchange package freight, 52 per cent., or 3,400 tons, has to be trucked over the city streets between individual freight houses of the various roads.

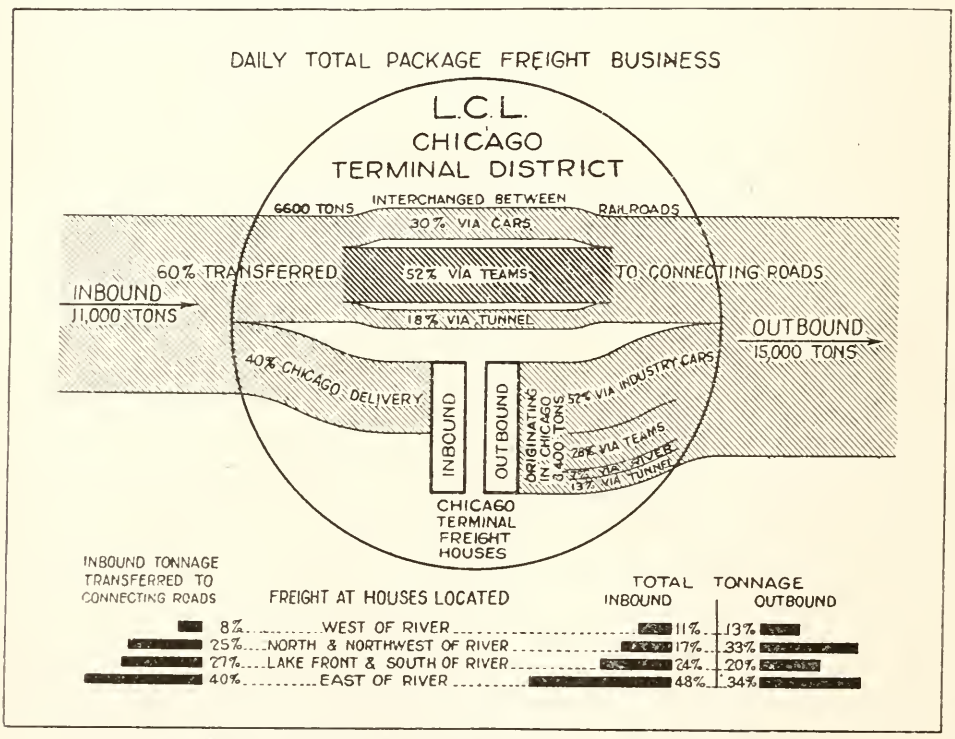

FIGURE 8. PACKAGE FREIGHT DISTRIBUTION.

Diagram showing that 11,000 tons of package freight comes to the city daily, 60 per cent of which is transferred through the terminal freight houses in the down town district; 52 per cent of this transfer freight, or 3,400 tons daily, is teamed through the down town streets. All of this transfer of freight destined to points beyond Chicago should be made outside the city, thus greatly relieving the streets. The quantities are approximate and compiled from available freight data which in some respects is not entirely consistent.

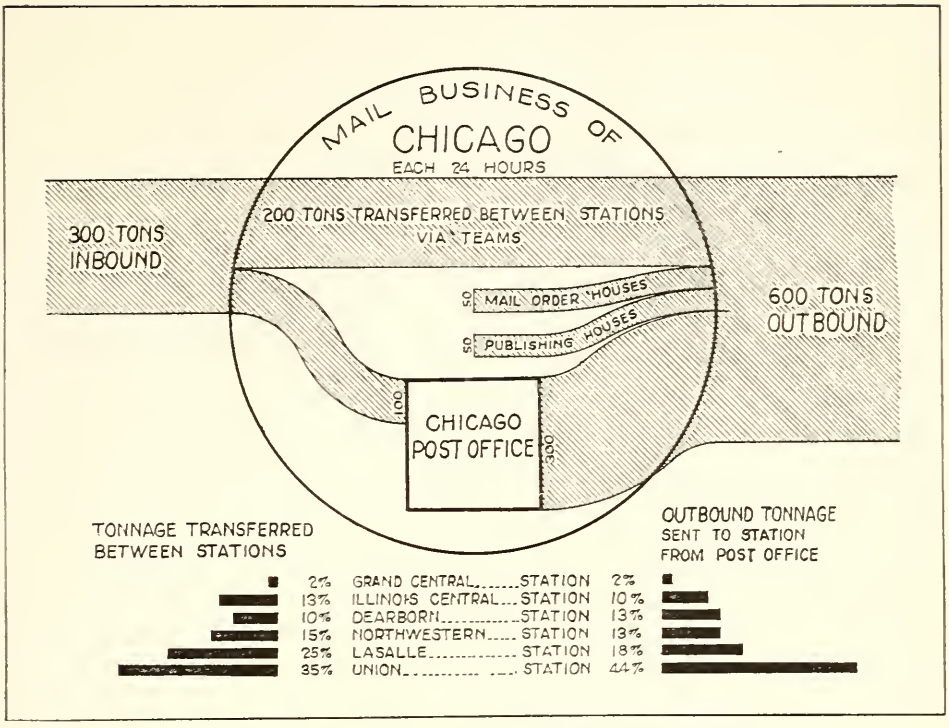

FIGURE 9. MAIL BUSINESS IN CHICAGO.

Showing the total volume of mail business in Chicago and the relative amounts handled at each of the railroad stations. The large amount of mail handled at the Union Station is shown in the lower part of the diagram. Of the total inbound mail, about two-thirds is destined for other points than Chicago and is now transferred between railroad stations by teams, at an annual cost of about $164,000. This expense would be largely eliminated in a single Union Station, and reduced with a smaller number of stations than are now operated.

Belt Lines: All of the railroad lines enter the city radially. As a result there have been developed a series of belt lines as follows:

1 Inner Belt known as the "Belt Ry. of Chicago." (South Chicago to Cragin.)

2 Middle Belt known as the "Indiana Harbor Belt R. R." (Indiana Harbor to Mayfield.)

3 Outer Belt known as the "Elgin, Joliet & Eastern R. R." (Gary, Elgin and Waukegan.)

The above are mentioned in the order of their distance from the center of the city. All radial trunk lines entering Chicago with three exceptions are financially interested in either the Inner or the Middle belt lines, these two belt lines being mostly concerned in the commerce of Chicago. The outer

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belt is understood to be owned entirely by the U. S. Steel Corporation.

The establishment of the Middle Belt apparently resulted from the expectation that eventually the Inner Belt would not be able to take care of all the belt line business due to the expansion of the city and also to provide private interchange facilities to certain interested roads. Each has a distinct function. The Inner Belt seems best adapted to handle cars destined to industries, team tracks and freight houses along its line, it being almost entirely within the city limits. Similarly, the Middle Belt will be the one upon which most of the transfer business could then best be done. The logical conclusion being that these two belt lines should harmonize and be operated at joint expense so that the various intersecting roads could patronize that belt line most convenient to them, thus tending to avoid congestion on either and increase the efficiency of both.

Clearing: The belt line is the nucleus of the interchange idea. A further and most important step towards efficiency is the idea embodied in clearing operations. It is noteworthy that the original project of A. B. Stickney, developed as early as 1890, rebuilt by H. H. Porter in 1898, only to remain idle for another period of years, is now being remodeled into a hump yard by the Chicago & Western Indiana R. R. (lessor to the Belt Ry. of Chicago) as the successful conclusion of the most important change in transportation methods in the Chicago District on record. This immense clearing yard is to have a standing capacity at present of about 8,500 cars with facilities to classify 10,000 to 12,000 cars per 24 hours. It can be expanded to have several times the capacity now contemplated by the construction of additional similar units adjacent to the present, each of about 12,000 cars capacity. The clearing yard is so located as to form a connecting link between the Belt Ry. of Chicago and the Indiana Harbor Belt R. R. at about 67th street. The intention of the railroads in-

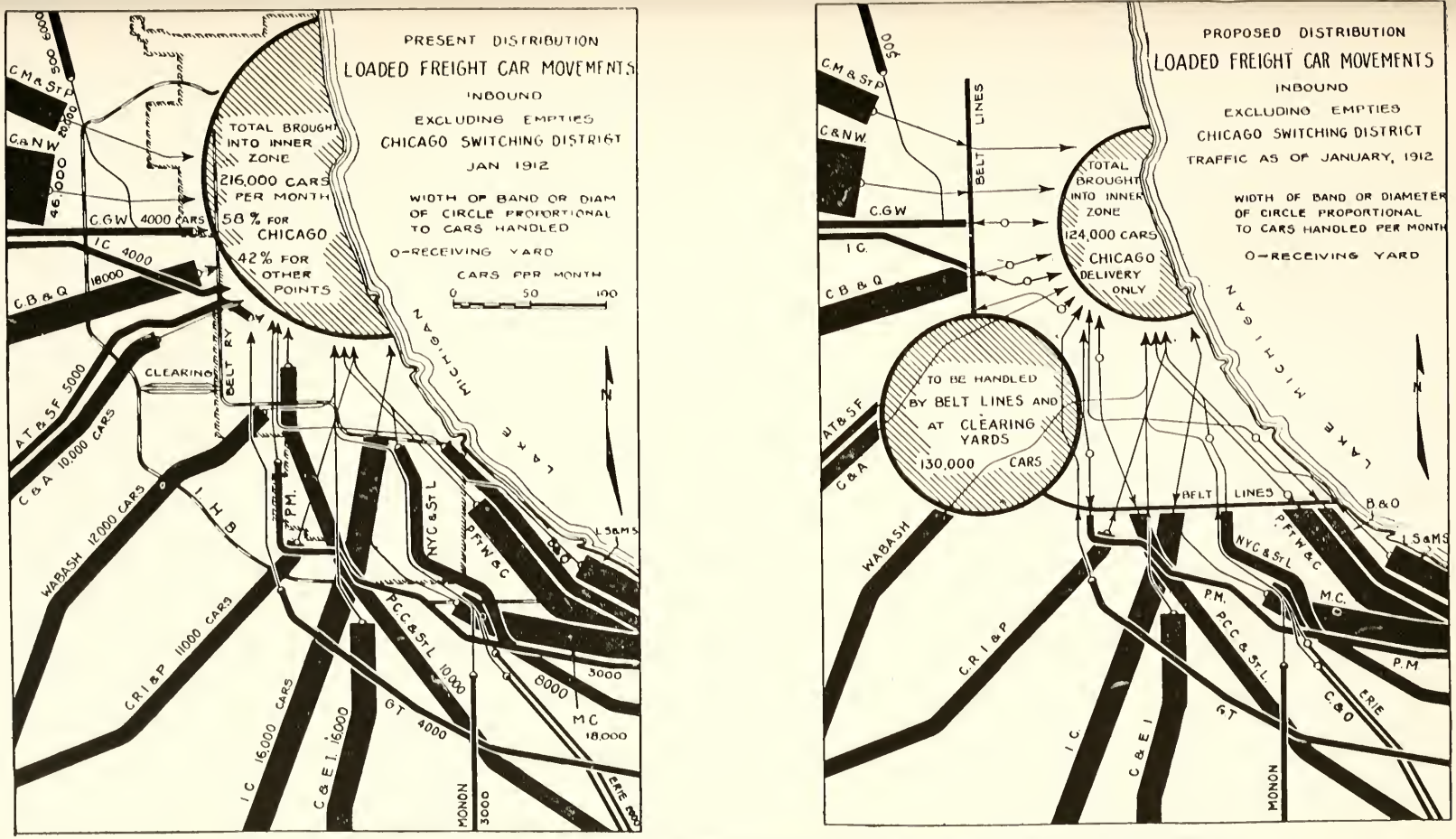

FIGURE 10. FREIGHT MOVEMENT DISTRIBUTION—PRESENT AND PROPOSED.

The diagram at the left shows the complexity of present freight movement and the large amount of freight brought to break-up yards inside the city limits. The diameter of the large circle is proportional to the total number of in-bound cars, some 216,000 per month, switched within the city, of which 42 per cent is interchange freight for other points. The diagram at the right, showing proposed method of operation, indicates the result of handling all interchange carload freight on belt lines and at Clearing, thus reducing the cars handled within the city by 92,000 per month and relieving the present congestion on the down town tracks. See fig. 6.

terested is that all interchange cars will be sent from each break-up yard to Clearing for classification and redistribution without entering the downtown district. The yard will be operated by the Belt Ry. of Chicago at the joint expense of the railroads interested, twelve in number.

Similarly, the Indiana Harbor Belt R. R. is administered at joint expense of its proprietary roads. At the present time there is no operating interchange between these rival belt lines which condition ought to be remedied, for joint operation will give each railroad the opportunity to patronize the most convenient belt line. If this suggested co-operation of the two belt lines is thus consummated, it will give Chicago the best freight interchange facilities of any city in this country, thus expediting the receipt and delivery of both carload and less than carload, or package freight.

L. C. L. Clearing: This inception of "Clearing" operations for carload interchange should furnish an incentive toward the immediate development of L. C. L. or package freight clearing as an integral part of the interchange proposition; for it would seem desirable that this less than carload interchange business be handled in a manner similar to the carload interchange, transfer stations to accomplish this being located at these clearing yards. This should materially decrease the switching and trucking in the downtown district and reduce the cost and expedite the handling of interchange business. Approximately 60 per cent. of 8,000,000 tons of package freight per year now handled at Chicago terminal freight houses should not enter the inner city at all. This means that a certain amount of the ground space now required in downtown Chicago could possibly be released without directly affecting the Chicago originating or delivery freight terminal facilities necessary. This release of interchange freight would in turn do much to relieve the encroachment on the business district and traffic congestion of the streets that is being complained of.

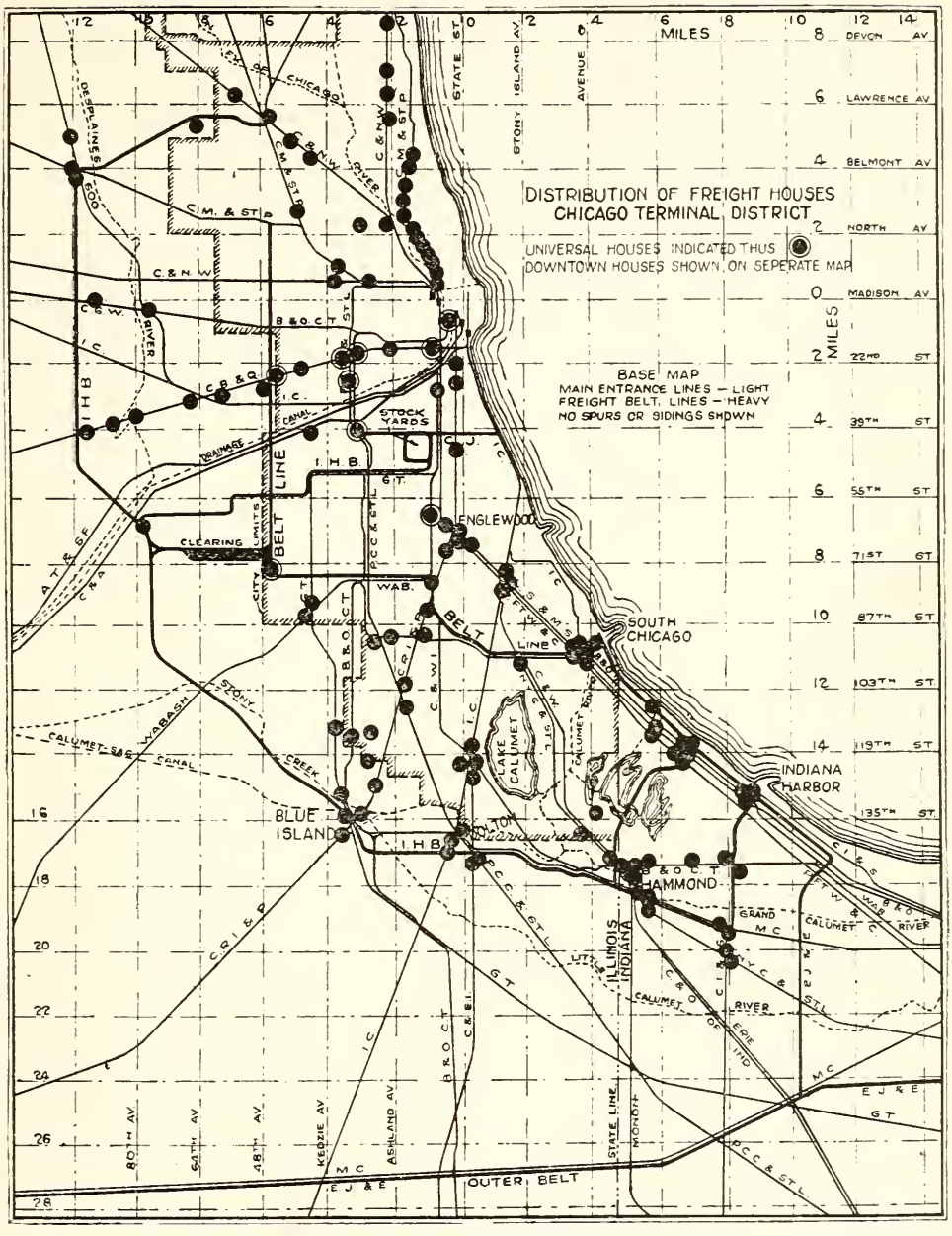

FIGURE 11. LOCATION OF FREIGHT HOUSES—CHICAGO DISTRICT.

Many of these freight houses in the outskirts of the city could be combined and operated at joint expense, thus making fewer and more efficient houses, to the advantage of both shipper and railroad.

This plan for a "package clearing," if carried to a finality on the co-operative principle, involves:

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1 Bulk freight clearing.
2 Package freight clearing.
3 Universal freight houses.
4 Universal lighterage stations.
5 Chicago Tunnel connections direct to Clearing.

Universal Freight Houses: Along the same lines may be mentioned the desirability of universal receiving stations. At numerous points throughout the city may be found groups of competitive freight houses generally quite unwarranted and more or less of a nuisance to the shipper, which groups could be combined each into one house and operated at joint expense. This scattering of freight receiving and delivery facilities naturally leads to a large proportion of "empties" and lightly loaded cars. In the universal houses empties would result from lack of business rather than from competition.

It has been suggested that all freight houses be universal houses. Theoretically, this would be ideal; actually, it is not practicable or desirable, at least for all downtown houses. With groups of freight houses throughout the city, the competitive idea has evidently been carried to the extreme in certain parts of the city, resulting in a multiplicity of houses where consolidation would probably be beneficial. But the problem immediately in hand concerns only the downtown district. Here universal houses, exclusively, are equally as impracticable as for the outer city. So long as divisional railroad operation exists there must be individual operation of freight houses to a degree.

The freight houses in downtown Chicago can naturally be divided into four groups:

A Those located east of the river between Harrison and 15th streets.
B Those located along Canal street, Madison street to 16th street.
C Those located along Kinzie street and the North Branch of the Chicago River.
D Those located on the lake front between the river and Randolph street.

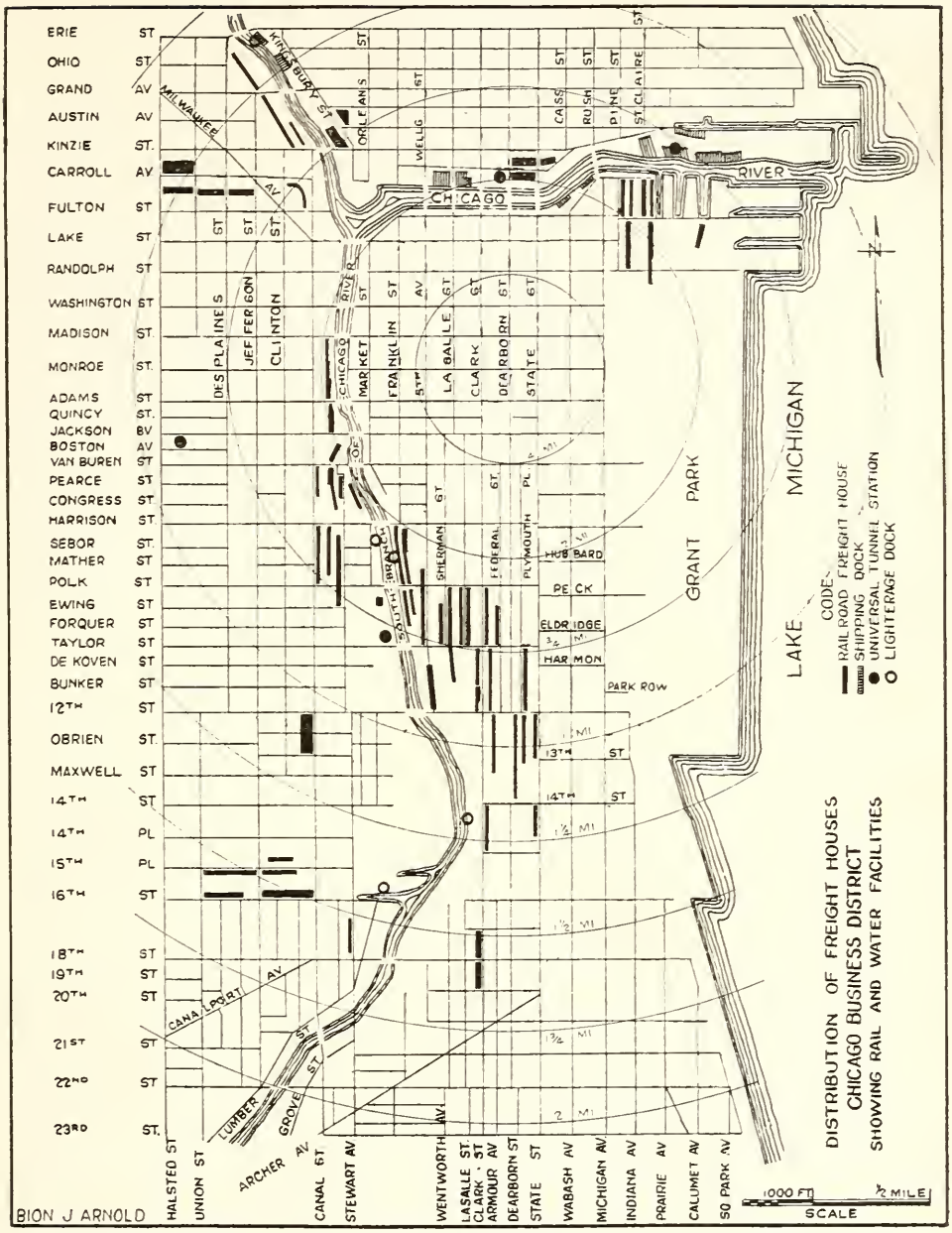

FIGURE 12. FREIGHT HOUSES WITHIN THE BUSINESS DISTRICT.

The relief of congestion in the Chicago business district and the removal of barriers preventing expansion is of great importance. This diagram shows the location of freight houses which have practically cut off all east and west streets south of Harrison street, and all but three avenues of approach from the south, thereby limiting expansion of the business district. The need of a type of development which will permit the opening of streets (free from grade crossings) is evident.

Usually a shipper in the district north of the river must haul his package freight down to the 12th street district to

send it south or east; and vice versa, a shipper located in the 12th street district must haul his freight clear across the city to the north to be able to ship it north or northwest.

It would therefore seem desirable to locate one or more universal houses, similar to those now in existence, in each of the above named districts to receive freight outbound and in addition deliver consignments of inbound freight for lines not having their own freight houses in that district; city freight to be moved between these universal houses and individual roads by cars, Chicago Tunnel, by motor trucks or lighters, as each case warrants. If the L. C. L. clearing plan, with schedule loading, proves practicable, these universal houses become all the more efficient. In any case, much long-haul trucking across the city may thus be saved to the consignee by having his goods consigned to the universal house nearest which he is located.

In the application of this principle, the final results will then be as follows:

1 One universal house in each of the four freight-house groups mentioned above, surrounding the business district, for both inbound and outbound business.

2 Individual in and outbound stations for city delivery (package freight only) and only for the road's own business.

3 All interchange business to be done at an outside clearing point.

These universal houses would be operated at joint expense, each road contributing on a tonnage basis.

As a suggestion, the present Soo Line house north of Randolph street, which is owned by the Illinois Central R. R., could easily be converted into a universal house for the use of all roads not reaching that vicinity.

One of the essentials in the working of this universal house plan is that the consignment be made definitely to a particular universal house; otherwise, all undesignated consignments must go to the downtown city freight terminal of the delivery road.

Team Yard Development: Freight house facilities for the downtown district can be improved greatly through intensive development (discussed later) and all of the proposed plans contemplate such development. But team yards are not susceptible of any great improvement in more efficient working, and the areas to be provided cannot well be economized over the present practice except by encouraging the use of unloading storage platforms or houses, accompanied by an adequate storage charge. Both the Pennsylvania and Soo terminals provide for elevated team yards but merely as a means of conforming to the elevations established for house tracks rather than to increase the efficiency of the team yards. Elevation or depression of team tracks is a disadvantage, for the reason that all teams must climb a grade. But this cannot be avoided on account of river bridges and separation of grades. An important fact bearing upon this subject is that inbound team freight amounts to about three times that of the outbound freight, so that with tracks elevated, three-fourths of the wagons climb the grade without a load. This lends weight to the desirability of inbound team freight being delivered to such yards as will avoid grade climbs.

The character of much of the material handled in team yards is such that it need not come to the downtown business district; it is in bulk and is often sent to storage yards before being taken to final destination. A few team tracks well downtown are convenient, but the majority may and should be located as far out as will furnish good service to the public which involves less expense for property and improvements.

In a later Section—12—on Freight Terminal Facilities, a comparison is made between present occupancy and proposed freight development, both as regards house and team tracks. At present over half of the car standing capacity west of the river is given over to other than house tracks. In this respect much improvement can be made.

Demurrage: In this connection Figs. 13 and 14 offer

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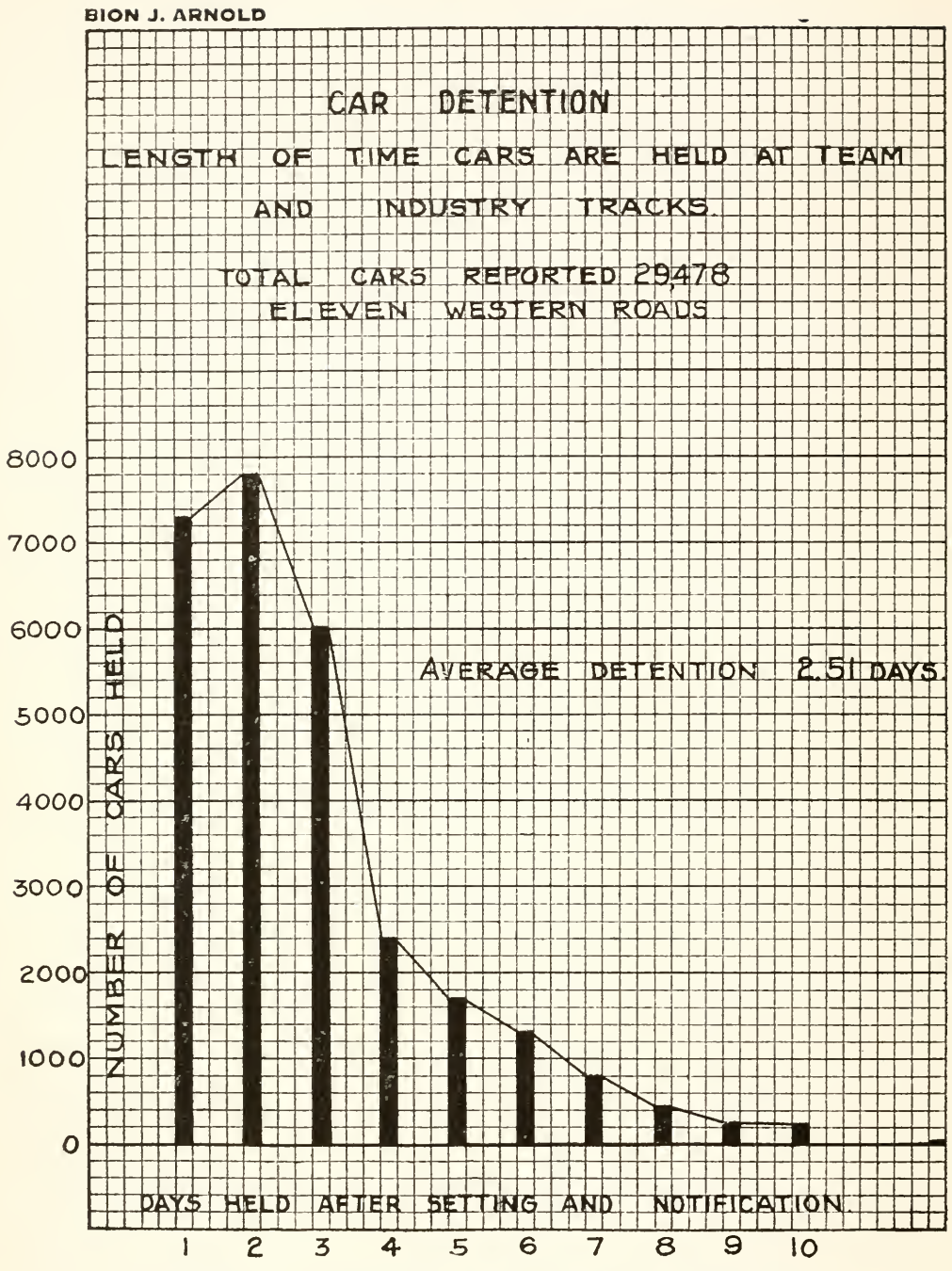

FIGURE 13. AVERAGE DETENTION OF CARS—1913.

Of a total of 29,478 cars reported to the demurrage bureau by eleven western roads during one month, the average layover or detention time was as shown on the above diagram. The average detention was 3.28 days up to October, 1912. As a result of doubling the demurrage charge, the detention time has been decreased to two and one-half days since that time. The use of cars for storage is one of the reasons for the present inefficient use of railroad equipment and the excessive requirements for car standing tracks.

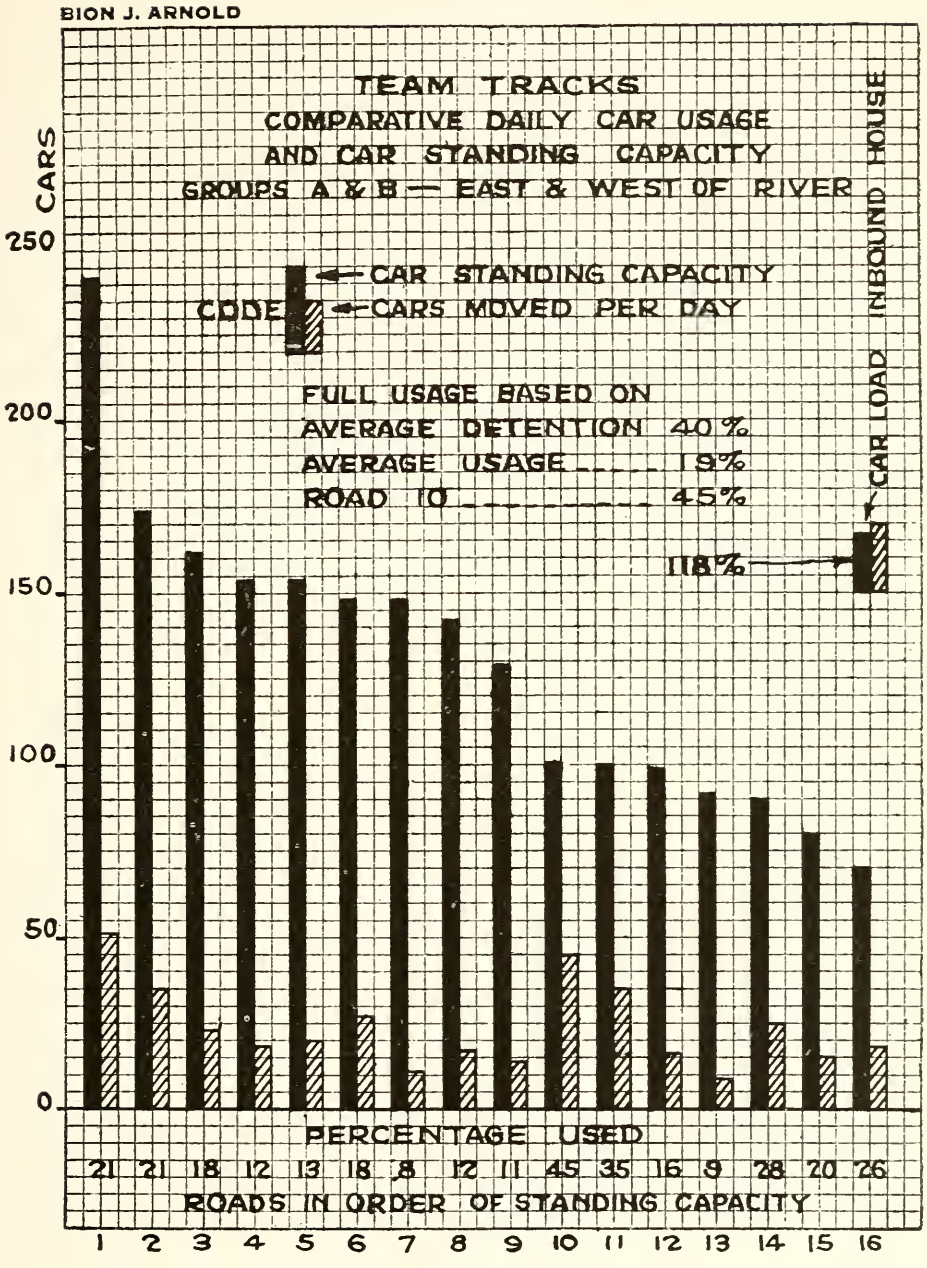

FIGURE 14. COMPARISON OF TEAM TRACK CAR STANDING CAPACITY AND CARS USED.

Diagram showing the car standing capacity of team tracks in the downtown district operated by the roads east and west of the river; also the actual number of cars handled per day. An average of about 20 per cent of total daily capacity of the team tracks is actually used. Road 10 shows most efficient use of team tracks. Comparison with the operation of the small but typical carload in-bound freight house (in which cars are unloaded into the house for storage, thus releasing the car) shows the relative inefficiency of unloading direct to teams. Regular demurrage rates apply to this house.

considerable light on one great source of improvement. The statistics indicate that the average team track is used daily to only about 20 per cent. of its standing capacity. For years the railroads have exacted a fine or demurrage charge for cars held over 48 hours after the first day of notification and setting. This charge is usually $1.00 per day after the 48 hours allowed for unloading. Shippers often willingly pay the charge so as to be able to unload at a more convenient time. But it has occurred that speculators or brokers for the purpose of holding a commodity for a certain desired market price would pay the demurrage upon hundreds of cars and thus tie up railroad equipment. The average detention period prior to October 15th, 1912, was 3.28 days per car. On that date, the demurrage charge was doubled and this has resulted in reducing the detention time to an average of 2.51 days per car.

As one possible method of improving these conditions, storage houses would seem applicable. For example, the consignor ships a car to a broker to be sold upon the Board of Trade. Upon arrival the car is inspected and held for sale and reconsignment to other points or it is sent to the city for sale and consumption. If the market price is not satisfactory, the market glutted, or if a sale cannot be made, then storage houses become of greatest use in avoiding delay and congestion to equipment, which at maximum shipping periods often becomes critical. It is important that these storage houses have ample car, street, and river facilities.

Chicago Tunnel Facilities: One of the premises of this study is the conservation of established properties, both in value and use. The Chicago Tunnel Company's system in its present condition demands careful consideration. Conceived as a means of relieving the city streets of traffic as well as decreasing the delay due to such a primitive method of transportation and handling, it represents a factor in the general scheme of transportation that should not be neglected, and

with a large investment entailed in sixty miles of underground structure there should be found for it a logical field of usefulness in any plan that has been or will be presented.

The Chicago Tunnel had several objects, which if the plans of its builders had matured, would have made the tunnel property today a unique and immensely useful auxiliary transportation and transmission plant:

1. By means of connections either direct or by elevator with all the important office, commercial and freight buildings, all freight building supplies (and possibly refrigeration and other utilities) could be delivered to the buildings below ground.

2. It offered quick transit to all freight houses and between city sample houses and outlying storage warehouses located convenient to rail and water.

3. All fuel and refuse service would be removed from the streets.

4. Transfer of L. C. L. freight between terminal houses could be carried on without the waste car mileage and delay now necessary in handling by the steam roads.

All of these functions would remain to the tunnel, in spite of the establishment of Clearing for both C. L. or L. C. L. freight, except this L. C. L. transfer or through business, which amounts to only 5 per cent. of its total daily tonnage handled. At present the tunnel does only one-tenth as much inbound business as it does outbound.

It appears necessary and practicable for the tunnel to make direct connections between its system and the Clearing yards, either through a tunnel bore direct or by means of tunnel car-lighters, *i. e.,* specially constructed box cars, in which the tunnel cars would be run to Clearing over steam tracks precisely as freight car lighterage is carried out in New York harbor and elsewhere by boat. Plans of the builders contem-

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plated such a lighterage system, giving direct rail connection between downtown business houses and Clearing without breaking bulk, or necessitating extra handling at the Chicago terminal houses, as at present. This would have removed from the downtown terminals of the railroads the larger part of the freight which now has to be trucked through the city's streets for delivery or collection and for transfer. With commercial warehouses at Clearing the utmost convenience would result especially to the downtown houses and department stores.

But the Clearing plan fell through and tunnel operations have necessarily been confined to incidental downtown business. An effort has been made to increase its business through the establishment of universal freight houses at which the small shipper could deliver his goods for railroad shipment; but this plan is handicapped in the absence of clearing yards. The maximum usefulness of the Chicago Tunnel depends upon a connection with a union package freight clearing house when established. If package freight business develops to any extent at the North Chicago harbor, a connection thereto will further remove from the streets any transfer traffic which will presumably grow to large dimensions in the future if the harbor is used for the purposes intended. If the river freight business develops it may be found practicable to build tunnel receiving stations under the bridge approaches at convenient locations and thus enable it to render a further public service.

Finally, the Chicago Tunnel ought to form a most useful vehicle for package freight handling in the business district and it is a much more logical railroad freight terminal than the present system of downtown freight houses operating under intensely congested condition of team delivery. Terminal delivery by tunnel ought to be considered in the same class as team delivery, the charge to be borne by the shipper. Some large shippers appear to demand the absorption of the terminal charge by the railroads, resulting in store door delivery, which would be prohibited by the government as a dis-

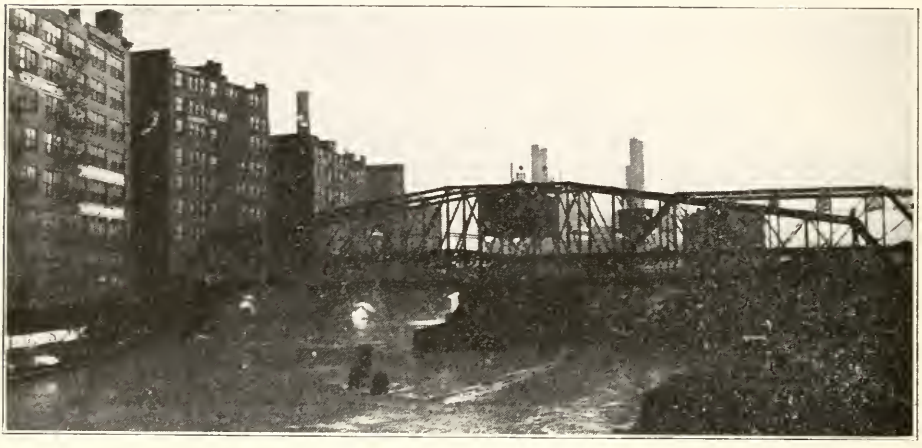
LOW STANDARD OF DEVELOPMENT WEST OF THE RIVER.

MECHANICAL HANDLING USED IN TEAM YARDS.

PUGH TERMINAL, ONE TYPE OF INTENSIVE DEVELOPMENT.

EXISTING TYPES OF FREIGHT DEVELOPMENT.

PRESENT DEVELOPMENT OF EAST RIVER BANK.



RAILROAD OCCUPANCY OF WEST RIVER BANK.

WHY NOT STRAIGHTEN THE RIVER?

BEARING UPON THE DEVELOPMENT OF CHICAGO RIVER.

crimination against the small shipper. The railroads thus have cause to fear that such a concession to Chicago merchants would necessitate the granting of similar privileges in all other cities whether by tunnel or other means.

SECTION 6.

WATER TRANSPORTATION.

One fortunate aspect of the situation created by the Union terminal proposals is the possibility of commencing the development of more intimate connection between rail and water along the Chicago River and South Branch. While the subject may appear somewhat removed from the terminal problem it is deemed a wiser policy to conserve water front development at a time when improvements therein are possible, than to defer until a future date when the improvements can only be carried out at enormous expense and disturbance.

The recent criticism directed against the city of Chicago by the War Department* for its failure to develop its water facilities seems well merited when the following facts are considered:

1 The drainage canal project was in part developed and widely heralded to promote direct water transportation from the Lakes to the Gulf.

2 The passage of a vessel by this established waterway as far as the south slips entails the opening of 22 bridges aggregating over one hour's delay to traffic and each intercepting a car line, elevated line or railroad main line.

3 Half of the channel is absorbed for railroad uses at the heaviest traveled street, leaving a channel only 90 feet in width.

4 Freight handling by lighters has hardly begun, *i. e.*, trans-shipment by self-propelled barges clearing the bridges without opening.

5 There are only five points along the river as far as the South Branch and the North Clearing basin where

*Report of Col. W. H. Bixby, U. S. Engrs., and Col. Geo. A. Zinn, Doc. 710.

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lighterage facilities are provided for cheap and convenient trans-shipment from water to rail and vice versa.

This failure to realize the unique advantages of the Chicago River and its branches as an interior freight distributor, is all the more indefensible when it is considered that the river is almost completely enclosed by railroad property. The proposals of the Pennsylvania Railroad not only do not take advantage of this opportunity in the slightest degree but actually prevent its accomplishment for all time by displacing its freight terminal facilities four blocks away from the river and, instead, by locating its passenger facilities along the river abutment without even the provision of a driveway or river road at dock level.

Lake Commerce: In the proper development of the river many perplexing problems are encountered and while it is not the function of this report to work out the solution in detail, two considerations should be kept in mind. The first relates to the possibilities of Chicago Harbor as a port of entry for long distance shipment from distant lake and Atlantic ports in addition to the shorter lake shipments. The second relates to continuity of the shipments via canal to the Mississippi basin when the contemplated deep waterway shall have become an accomplished fact.

The record of entries and clearings of the Chicago River commerce is clearly shown in Fig. 15 for nearly a quarter of a century. While the registered tonnage gradually increased up to about the year 1900, it has gradually fallen off since then. Both actual vessel movements and actual tonnage handled through the Chicago River has steadily decreased since 1889. While the greater part of the loss in tonnage since early days has been due to the cessation of the lumber trade, it is also true that the gradual increase in the cost of water shipment and the gradual reduction of the differential rate between steam and water has necessarily operated to discourage lake

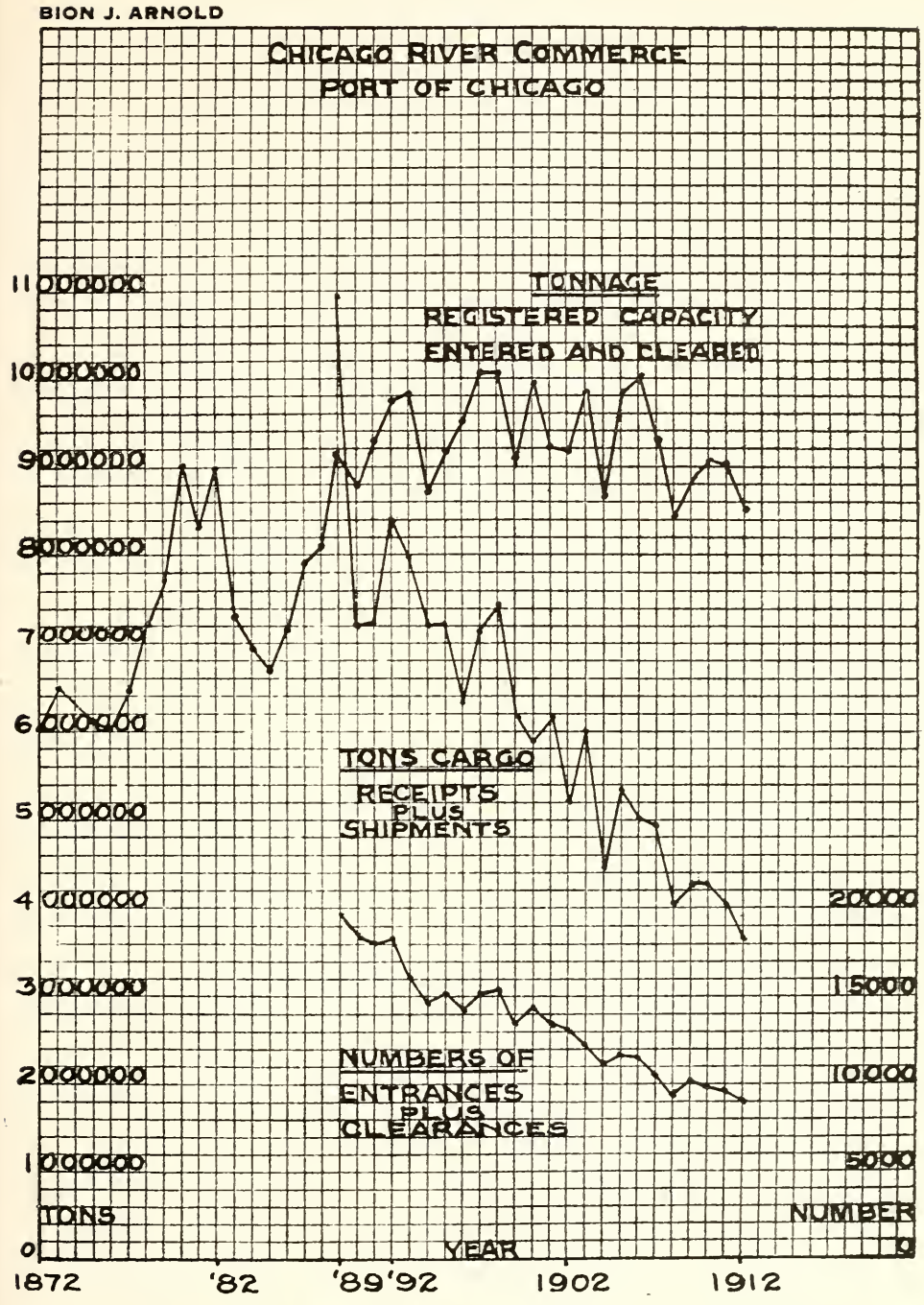

FIGURE 15. RIVER COMMERCE—PORT OF CHICAGO.

Diagram showing the variation in vessel movements and tonnage handled since 1872. The number of vessel movements and the amount of freight handled has been steadily decreasing since 1889. The registered tonnage of vessels showed a slight increase up to 1900, since when it has been gradually decreasing. This loss of over 50 per cent in freight business transported by water clearly indicates that heavier terminal charges for lake shipping tend further to decrease the tonnage handled by water, which should be avoided.

traffic. It is therefore evident that any further restriction such as the imposition of additional terminal charges on lake shipping which is already operating on too small a margin, cannot but seriously handicap the commerce of the port of Chicago, the development of which was one of the primary objects of the Sanitary District improvement.

Deep Waterway: On the other hand, the completion of the deep water project of the "Lakes to the Gulf" may make it easier for the trans-shipment charges at the port of Chicago to be absorbed in the long haul rate to the gulf. Assuming a fourteen foot channel as the probable maximum, trans-shipment must evidently take place at Chicago and if some type of self-propelled light draft barge can be developed for lighterage duty in the Chicago River and suited also for river service—then and only then would fixed bridges on the Chicago River seem to become a possibility.

Bridge Delays: Perhaps the most powerful argument for the development of lighterage is the tremendous traffic obstructions which the river bridges now entail. Even though "closed hours" have been established by the city to relieve somewhat the serious congestion and delay to local passenger transportation during morning and evening rush hours, yet it is a fact that transportation for the north and west sides including the west side passenger stations, is at times badly crippled by successive bridge openings. Considering the various bridges, it is found they range from ten swings per day at Jackson boulevard to 24 at Rush street requiring from 20 minutes to over an hour to perform their operations. (See Table 13.)

The United States engineers have pointed out that the enforcement of bridge closing hours simply increases the rush of shipping immediately thereafter. This is clearly indicated by the record, Fig. 16, taken at a time when somewhat earlier closing hours were observed in the morning than at present. While there undoubtedly is a certain hardship imposed on shipping by these "closed hours," it is inconsiderable as com-

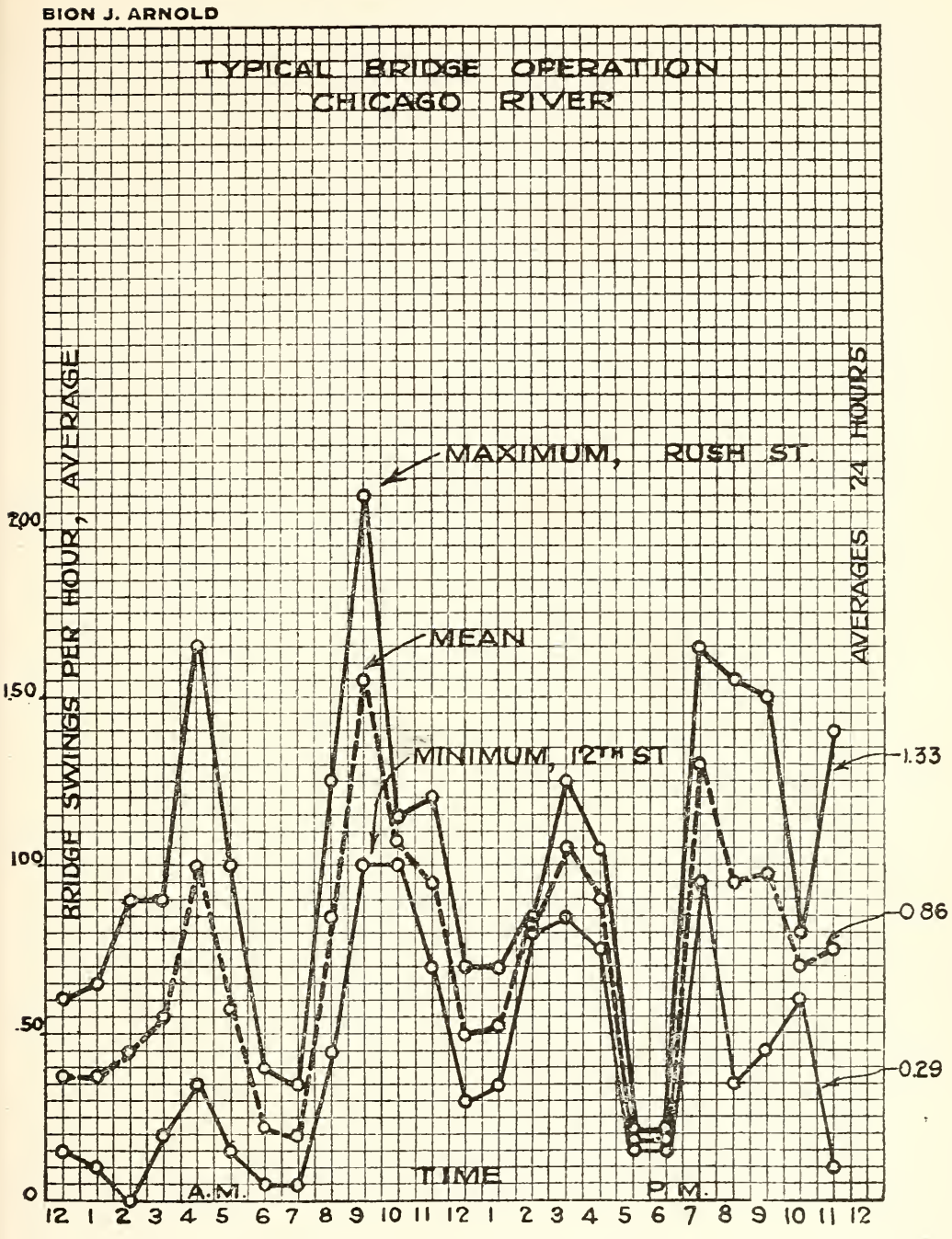

FIGURE 16. TYPICAL BRIDGE OPERATION, CHICAGO RIVER.

A strong argument for the use of lighters is the delay caused by the operation of river bridges. In this diagram is shown, for two typical locations, the average number of bridge swings per hour during a fifteen-day period in June, 1913. Note the increase in river traffic, indicated by the number of bridge swings, following the closed bridge hours (6 to 7 a. m. and 5 to 6 p. m.), resulting in increased congestion to street traffic. The large number of swings of the Rush Street bridge, as compared to the 12th Street bridge, indicates the heavy river traffic in the main channel. Closing hours now extend until 9 a. m.

pared with the enormous passenger traffic that would be delayed by open bridges during rush hours. Therefore, the relative delay to shipping is believed to be very much exaggerated; for the passenger rush hour can neither be changed nor spread while the arrivals and departures of vessels on trips of 48 hours or more could clearly be timed without serious inconvenience to conform to these closing hours.

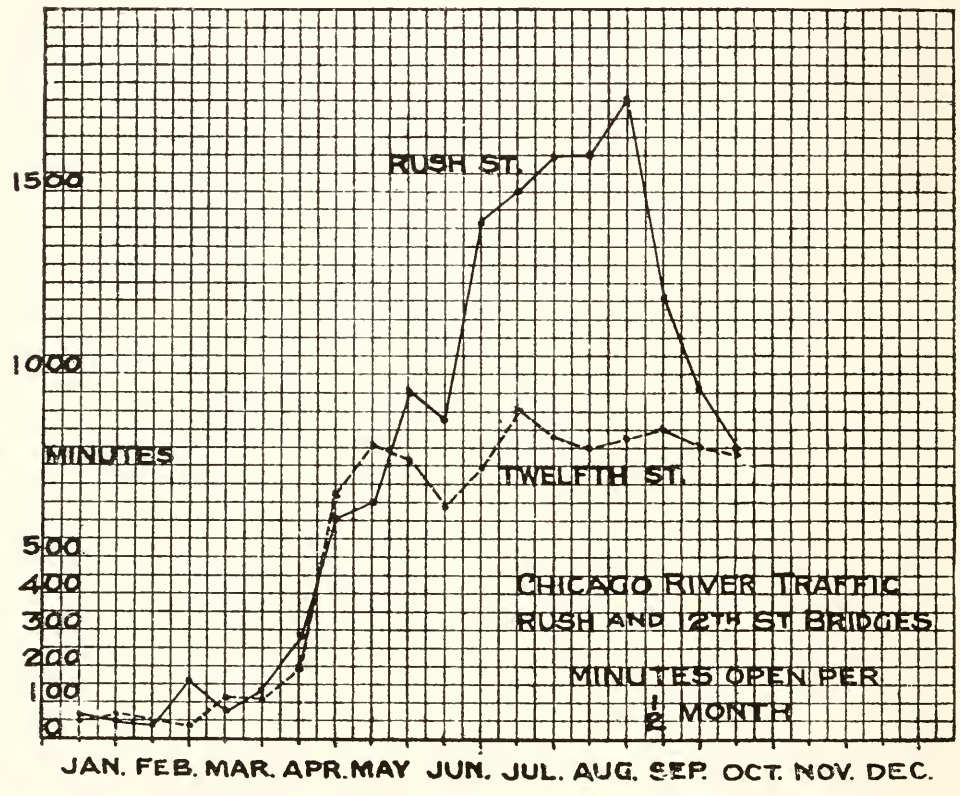

FIGURE 17. CHICAGO RIVER TRAFFIC.

The variation in Chicago River traffic by fifteen-day periods, as measured by the total open time of river bridges, is shown in the above diagram. At 12th Street where freight is handled exclusively, traffic is comparatively constant from April to October, whereas the addition of passenger boat traffic during the summer in the main branch of the river, creates a decided peak in July and August at Rush Street.

The measure of this inconvenience is found in the diagram of car movement, Fig. 5, in which the relative volume of car traffic over each river bridge is indicated, together with the territory served by the nine important trunk

lines so obstructed. However, the demands of passenger boat travel during the summer would seem to require special consideration. In Fig. 17 is shown the seasonal variation in travel from month to month at the Rush and 12th street bridges respectively. While the freight travel holds about constant from April till October down the South Branch, the Rush street bridge handles about twice the volume of boat traffic, due mostly to scheduled and excursion passenger business. Here there is some argument for shorter closing hours at the outer bridges until the completion of the outer harbor piers permits passenger vessels to berth on the lake front.

An average clearance of about seventeen feet above datum is now available under most of the city bridges, the majority of which have arched instead of straight lower chords such as there should be for maximum use of the river. If such straight chords were used as in the new Rush street bridge, there would be ample clearance for lighters although not sufficient for lake boats. Therefore, the conclusion is unavoidable that until a channel independent of the river is provided for entering the canal, capable of accommodating deep draft lake vessels, the Chicago River and its branches must be continued in use as the only available terminal for water shipments destined for Chicago and inner-state points on the canal. By the same token, river front development becomes imperative. While car lighters might be developed to some extent the direct railroad deliveries now possible along the lake front from the river south as far as Gary precludes the possibility of car lighters on the river ever becoming important.

Railroad Bridges: At present nearly all railroad bridges are low bridges and require opening for practically all river craft. For this reason the number of bridge movements are several times as frequent as those of the adjacent city bridges. The excessive time and delay required for the railroad bridges constitutes one of the most powerful arguments for railroad re-routing and terminal re-arrangement both from the stand-

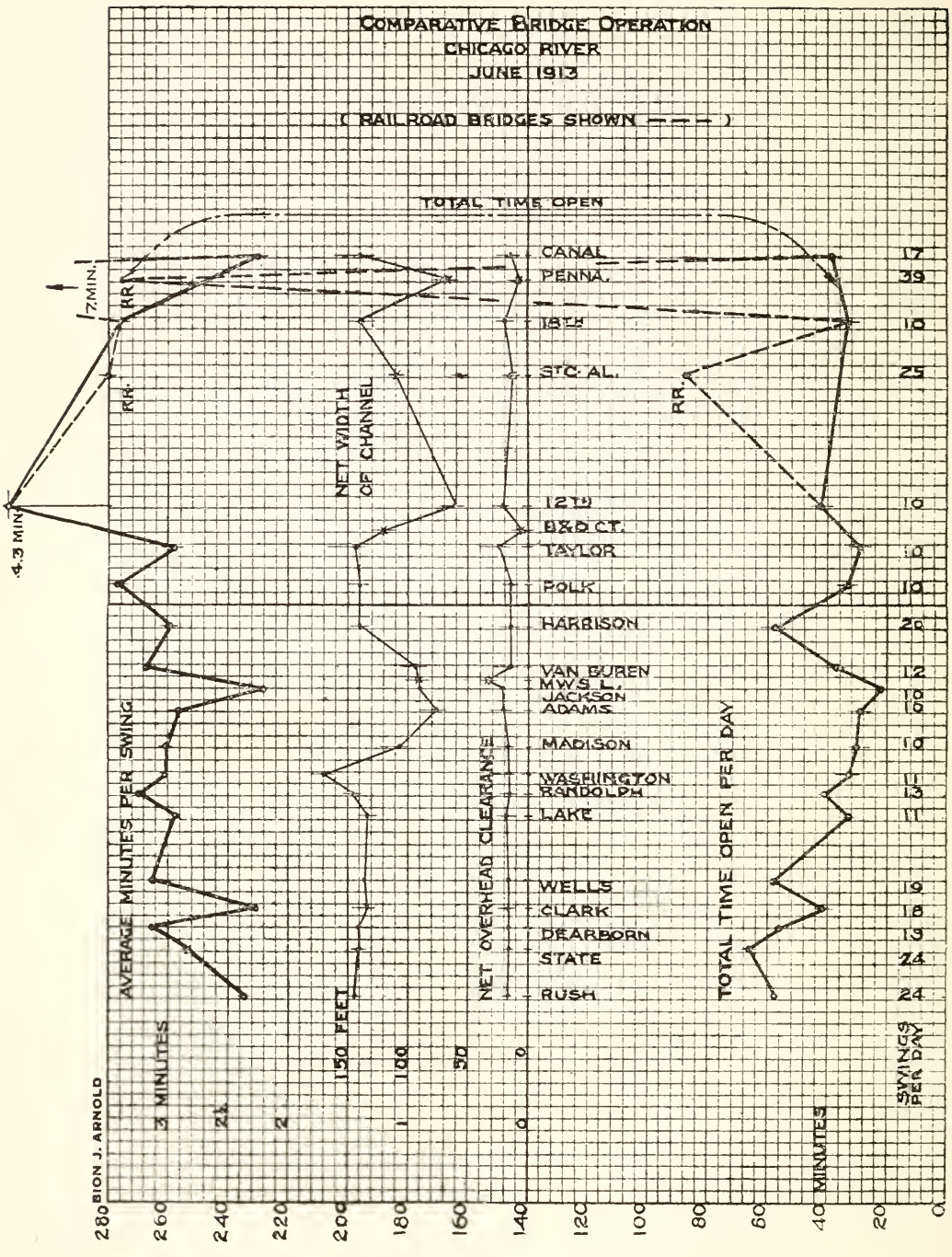

FIGURE 18. COMPARATIVE BRIDGE OPERATION.

The obstruction to street traffic caused by bridge operation is shown in this diagram at various bridges, by the average time per swing and the total time bridges are open daily. Obstruction to river traffic at different points is indicated by the available width of channel and the bridge clearance. The delay caused by the large number of openings necessary for the low railroad bridges emphasizes the desirability of re-routing entrance lines and arranging stations so as to avoid river crossings. At 12th Street the unusually long time required per swing is the result of delays in the operation of the adjacent B. & O. C. T. bridge.

point of the city, the public and the railroads. With as many as forty bridge openings per day of three and one half minutes to seven minutes each, the argument seems conclusive that railroad bridge crossings ought to be avoided. Further, the necessity for straightening of the river seems imperative and the use of the space thus made available for re-locating passenger terminals would not only avoid the delays of river crossing but permit the expansion of the business district to the south which these east side terminals now obstruct. In Fig. 18 are indicated the typical operation of railroad bridges as compared to city bridges. While the St. Charles Air Line is a fairly high bridge, the Pennsylvania, B. & O. and North Western bridges are low and much slower than those of the city.

SECTION 7.

CAPACITY AND EFFICIENCY OF OPERATION.

In order to arrive at an impartial judgment as to the merits and demerits of these particular plans discussed in this report in their application to the Chicago situation, it is necessary to classify them as to type and methods of operation and to apply an analysis from two essential viewpoints—*capacity* and *efficiency*.

First, the unit capacities of station and throat tracks have been determined from actual observations of the present Chicago terminals for both through and suburban service in the proper ratio, making due allowance for the standing time used by the various kinds of trains and the unavoidable interferences in the throats. From these unit capacities the ultimate capacity of the present terminals in the aggregate may be found, which furnishes a measure of how nearly these stations have out-grown the service. This also furnishes a basis for estimating the capacity necessary to provide for anticipated growth.

Second, the results of readjusting the present properties and regrouping the entrance lines may be determined, thus giving a measure of the advantages of consolidating terminal traffic. It is only by this method of analysis that definite judgment is made possible as to the relative advantages of a single or of multiple stations. This latter subject is taken up more definitely in Section 10.

Types of Stations: Practically all of the terminal arrangements existing and proposed, may be studied under two general types: (a)Stub terminals, (b) through terminals.

The stub terminal necessitates a reverse movement of trains, whereas in the through terminal trains move in the same direction, thus avoiding interference at the entrance throat when backing out while other trains are coming in. With steam operation a pull-through station places the locomotives outside of the train shed, whereas incoming trains, in a typical stub station, must face the headhouse, thus occasioning a considerably longer walk for passengers after alighting. However, in the back-in scheme of operation, such as at the St. Louis terminal, trains may always be headed out, even with stub tracks, although the backing in introduces an element of congestion on the main line through tracks. In the stub terminal the concourse may be so located that passengers reach the trains directly without climbing stairs; in the through or loop terminal, an overhead or underground concourse is necessary, which may or may not be seriously objectionable, according as the station levels are planned with reference to streets or viaducts leading to the concourse.

The through station, in effect, is a reservoir placed in the main line tracks. A loop station accomplishes approximately the same object, and the same analysis applies as to the through station. In the loop station, however, it is difficult to utilize effectively the space inside the loop unless it be filled with stub tracks, and used as a coach yard and for express standing tracks, and as the loop must be located within or in

front of the station proper, its use necessitates the occupancy of a large amount of expensive land for coach yard purposes. It is frequently proposed to reserve one side of a station exclusively for inbound trains and the other side for outbound trains, but this arrangement is decidedly uneconomical of space unless provision is made for overlapping the outbound and inbound sections. In the evening rush hour, outbound trains number 5 to 1 of those inbound; in the morning rush, practically the reverse is true. Consequently the overlapping use of tracks becomes necessary or fully 40 per cent. of the station capacity becomes useless. This also applies to a double deck stub terminal with only inbound trains on one level and only outbound trains on the other level. The only logical separation is for the purpose of accommodating different groups of roads, which is the case in the proposed Pennsylvania Plan.

Factors Influencing Capacity: In determining the capacity of a railroad terminal, there must be taken into consideration a large number of factors, each involving an element of delay, all of which reach a climax at the heaviest period of train movement during the rush hour. Capacity in this sense does not mean simply the standing capacity for cars or trains, but the ability to pass trains through the station in the order required during the maximum rush periods, the duration of which is a determining factor as later discussed.

Assuming that a few minutes variation is possible in the scheduled leaving and arriving time of trains so as to utilize the entire capacity of the station, these elements of delay are as follows:

1. Standing time of trains, inbound and outbound.
   (a) Time for loading and unloading passengers, delay in examining tickets, and time demanded by the public in requiring trains to be made up before leaving time.
   (b) Time for loading and unloading baggage, mail and express, handled either between tracks or on sidings.

2. Time for setting switches and signals.
3. Time to run in and out of station.
4. Interference with other tracks, dependent upon class of service, length of train, routing through throat, location of coach yards and express sidings.
5. Amount of extra switching through the throat, dependent upon the use of the road or yard engine for hauling drags, the make-up of the train, where the make-up is done, and whether baggage, mail and express are handled on the station platforms or on sidings.
6. Irregularities in scheduled train movements, due to late arrivals.

To obtain reliable values for some of the above constants, observations were made in both the C. & N. W. and La Salle terminals to determine the time required to run in and out of the station, the average interference with throat and station tracks per movement, the time for unloading trains and the speed of trains through the interlocked throat. The results obtained were generally consistent and have been used in making this study.

Graphical Studies: In order to reduce this complex subject to a basis for easy comparison, the following studies are presented:

1. Station capacity:
   (a) Effect of station stop, stub station, through traffic.
   (b) Track capacity, stub station, variable traffic ratio.
   (c) Comparative track capacity, variable station stop, inbound suburban service, no extra switching; single berth stub versus single and double berth through stations.
   (d) Comparative effect of extra switching moves on track capacity for inbound through service, variable stop; double end stub versus double berth through station, tandem operation. (Pennsylvania problem.)

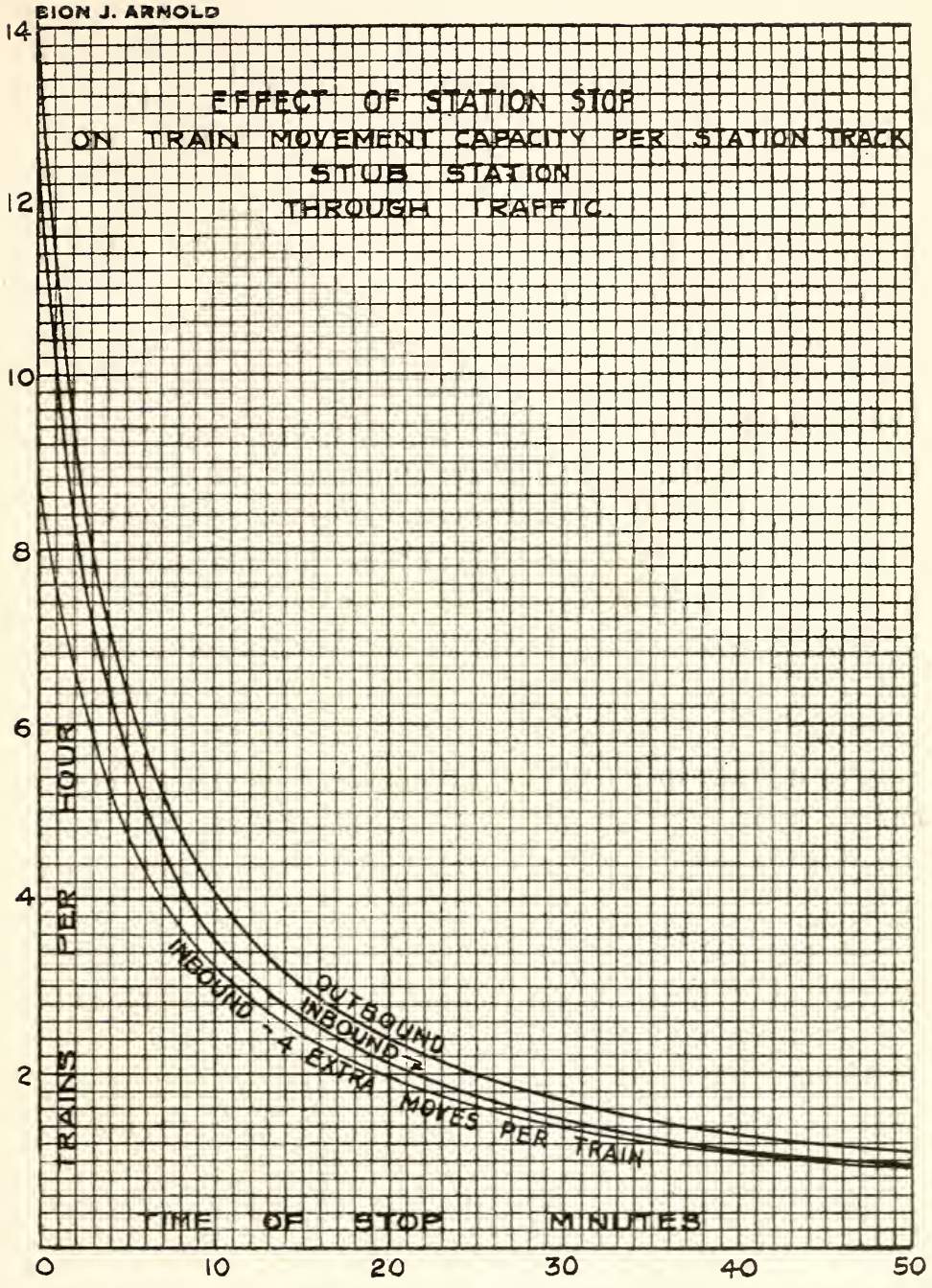

FIGURE 19. EFFECT OF STATION STOP ON STATION CAPACITY—STUB STATION—MAIN LINE TRAFFIC.

The time of station stop is of the greatest importance in its effect upon capacity. This diagram shows graphically the relation of standing time to capacity in a stub station—also the effect of four extra switching movements per train upon the capacity of the station for in-bound traffic—indicating that the latter is of little importance as regards station track capacity, except for short-stop trains. Switching has practically no effect upon out-bound traffic.

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2. Throat capacity:
   (a) Effect of extra switching upon throat track capacity, variable traffic ratio, stub station.
   (b) Ratio between throat and station track capacity, stub station, inbound traffic, variable traffic ratio.

Reference to Figs. 19 and 21 showing the effect of the standing time of trains indicates that this quantity is the most important one affecting station capacity.

In order to obtain maximum capacity it is therefore necessary to reduce the standing time to the practical minimum. This minimum stop, in the case of inbound trains, is fixed entirely by the time of unloading baggage, mail, express and passengers, so that it is desirable to avoid long delays due to the unloading of bulk mail or express by providing special sidings for such materials, although as is shown later, excessive switching will congest the throat tracks. For outbound trains, on the other hand, the loading time is not always the factor determining standing time inasmuch as good service requires a train to stand for a reasonable length of time, depending upon the class of train. Inasmuch as the standing time of trains in a terminal station, especially outbound trains, is dependent upon other considerations than the bare time for loading passengers, the same standing time is applicable to any type of station, irrespective of the distance from waiting room to train and other facilities for the rapid loading of passengers.

For the above mentioned studies, 30 and 15 minutes were chosen for outbound and inbound through trains and 12 and 3 minutes for outbound and inbound suburbans respectively. These quantities are applied in estimating the capacity of all stations whether through, stub or loop.

In Fig. 19 the values take into consideration all factors bearing upon the capacity per station track such as interference with trains, switching movements, time for towerman and signals to act, time lost in back haul, etc. The space between the two curves for inbound trains, representing the variation

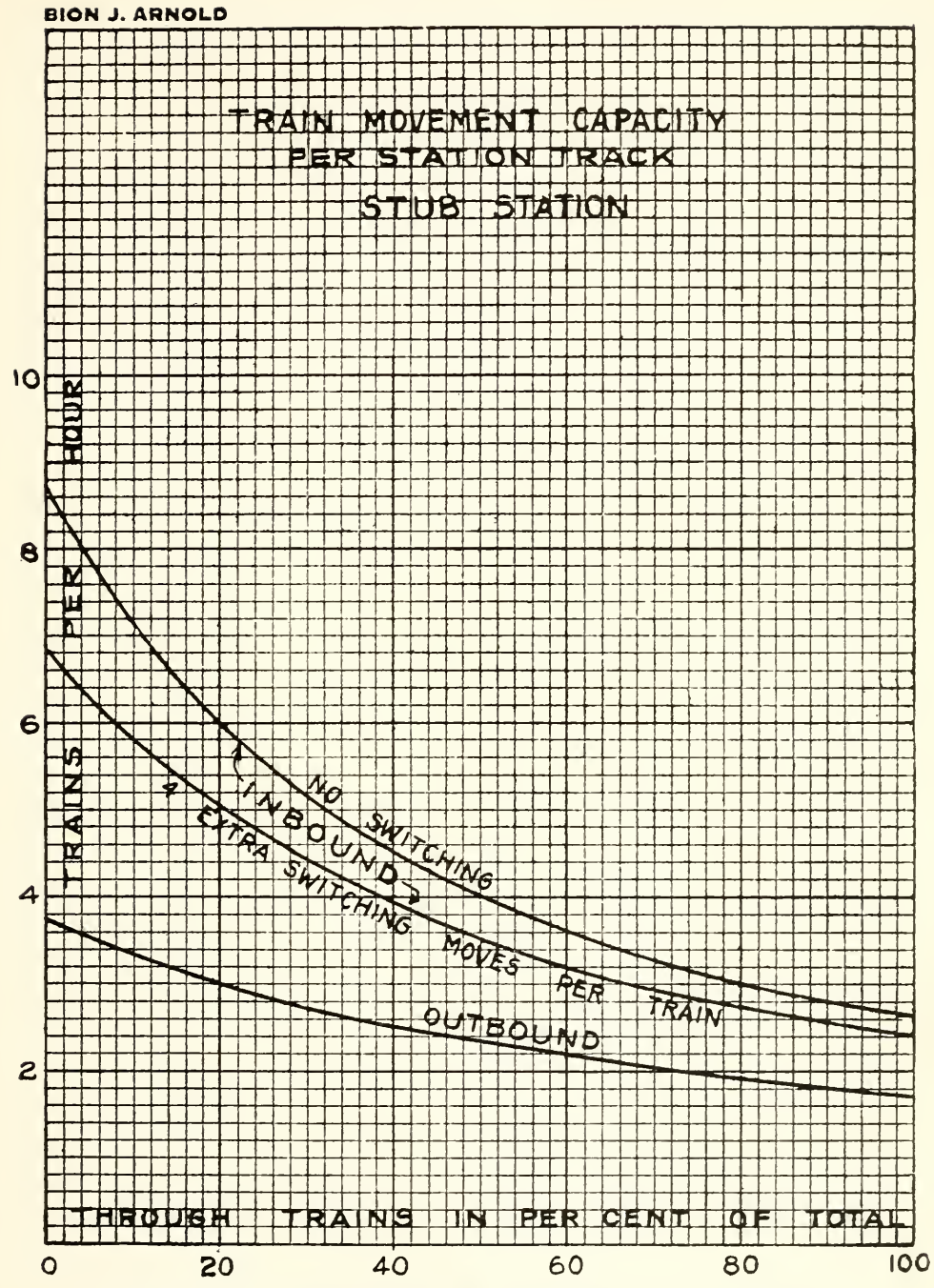

FIGURE 20. STUB STATION CAPACITY PER TRACK—VARIABLE TRAFFIC RATIO.

This diagram shows for the assumed time of stop the capacity per track in a stub station, for various proportions of through and suburban traffic. Thus a single track can handle an average of 3.8 out-bound suburban, or 1.7 out-bound through trains per hour. As in Fig. 19, the effect of switching is most marked for the short stop suburbans.

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due to switching indicates that some station capacity could be saved by switching all baggage and express cars onto special sidings. This method of operation, however, if carried to the extreme, results in congestion of the station throat and approaches, and possibly in an actual decrease in capacity.

The class of trains handled—through or suburban—as well as their direction—in or outbound—has a marked effect upon the train handling capacity of a track, due principally to the difference in standing time. The curves in Fig. 20 show the capacity of a stub station per track for in and outbound service, with a variable ratio between the through and suburban traffic handled. Thus the capacity per track for inbound service decreases from 8.7 for entirely suburban trains to 2.6 trains per hour for entirely through service. The effect of switching movements in the station is shown to be much less for through than for suburban trains, indicating that the most efficient operation will result from handling at least the latter class of traffic in and out of the station with a road engine and without first breaking up the train.

Greater capacity is obtained in the through or loop than in the stub station by the elimination of, (1) delay due to necessity for backing trains out of station, (2) interference with other movements due to two way operation over the same track, and (3) delay resulting from switching operations. The time saved varies from 1½ to 3 minutes per train which is of importance only on short stop trains such as suburbans. For through trains, which stop from 15 to 30 minutes, the short time saved amounts to only a small percentage of the total occupancy time. Therefore, the through or loop station is principally advantageous for suburban service, the increase in capacity being from 25 to 35 per cent.

Double Berthing: Double (tandem) berthing in a stub station may materially increase the capacity, but such operation under normal conditions has not been considered, on account of the long walk required from the concourse to the

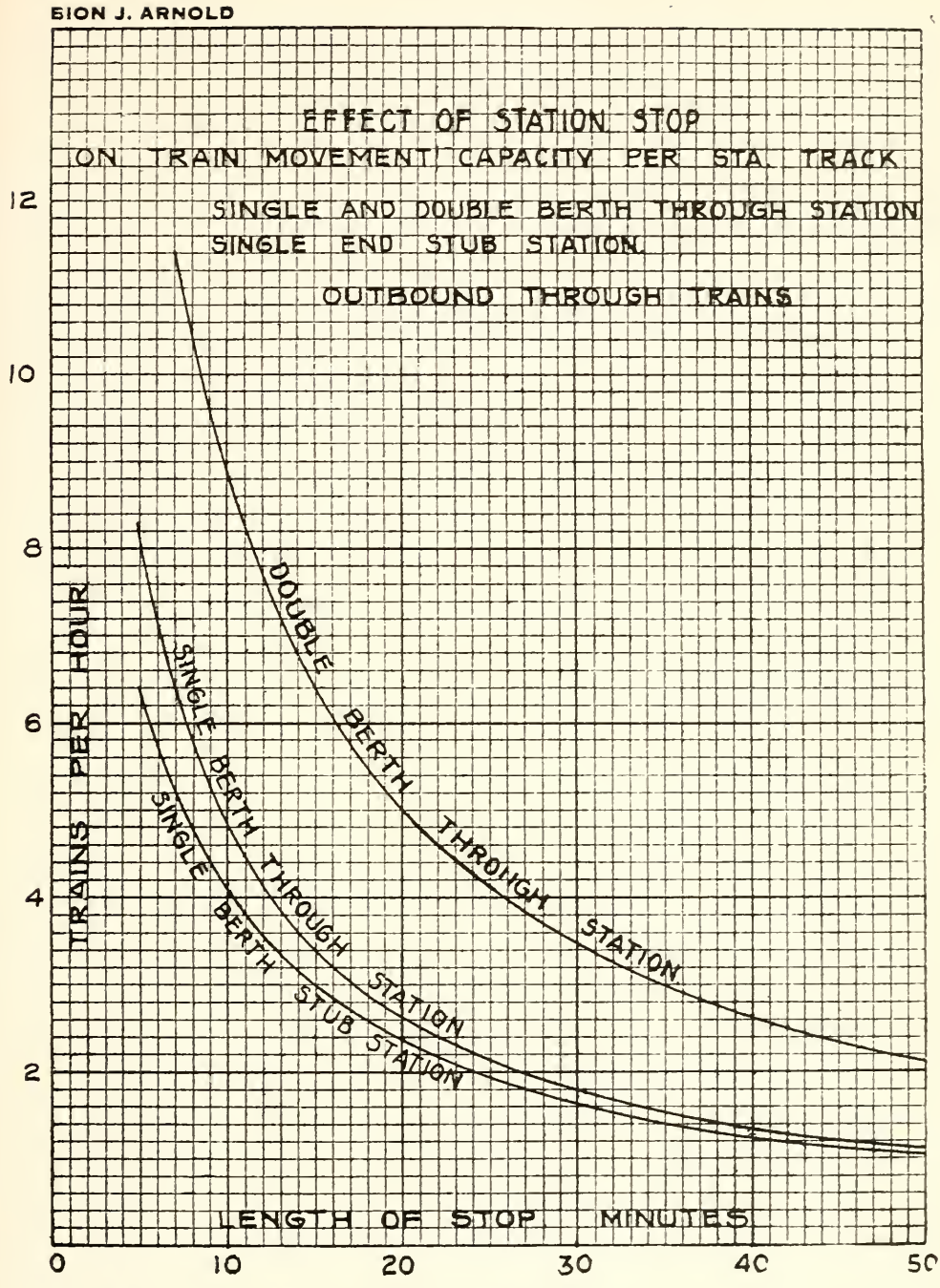

FIGURE 21. COMPARATIVE CAPACITY, STUB AND THROUGH STATION.

Showing the effect of variable standing time upon the capacity of single berth stub, single berth through and double berth through stations (tandem operated) for out-bound service. For short stops, the single berth through station has about 30 per cent more capacity than the stub station, but this increase becomes almost nil for longer stops. Double berth through stations have slightly over twice the capacity of single berth stubs for any length of stop, but lose this advantage quickly where much switching takes place.

coaches of the second train. As an emergency measure, or in handling very short suburban trains, it is perhaps justified.

The through station lends itself readily to tandem operation which increases its capacity to slightly over twice that of the stub station. (See Fig. 21.) However, any switching necessary in this type of station materially reduces its capacity, due to the delay in removing cars from the rear train. For main line service, therefore, where some switching is almost unavoidable, the double berth through station does not effectively use its track space. The double end stub station such as proposed by the Pennsylvania Co. can fairly be compared with the double berth through station, inasmuch as it occupies about the same ground. Fig. 22 shows this comparison for various lengths of stop, indicating that the two types have about the same capacity when no switching movements are necessary, but that the loss due to switching is much greater in the double berth through than in the double end stub station.

Summarizing, it appears that the single berth through or loop station has a material advantage over the single stub station only in handling a class of trains, such as suburban, which stop a very short time. With the longer stop required for main line trains this advantage practically disappears, so that for a terminal station, the through or loop type is not more desirable, so far as capacity is concerned, than the stub station. Considering double berth stations, the through type is in no case materially superior and in some cases is inferior to the double end stub.

Throat Capacity: Outside of such factors as train length, speed over the throat tracks and signal constants, the amount of switching performed at a station is the most important factor entering into the capacity of the throat tracks. Also, the location of coach yards, express tracks and mail tracks has a considerable effect, inasmuch as poor location may necessitate so much cross movement as to seriously interfere with the

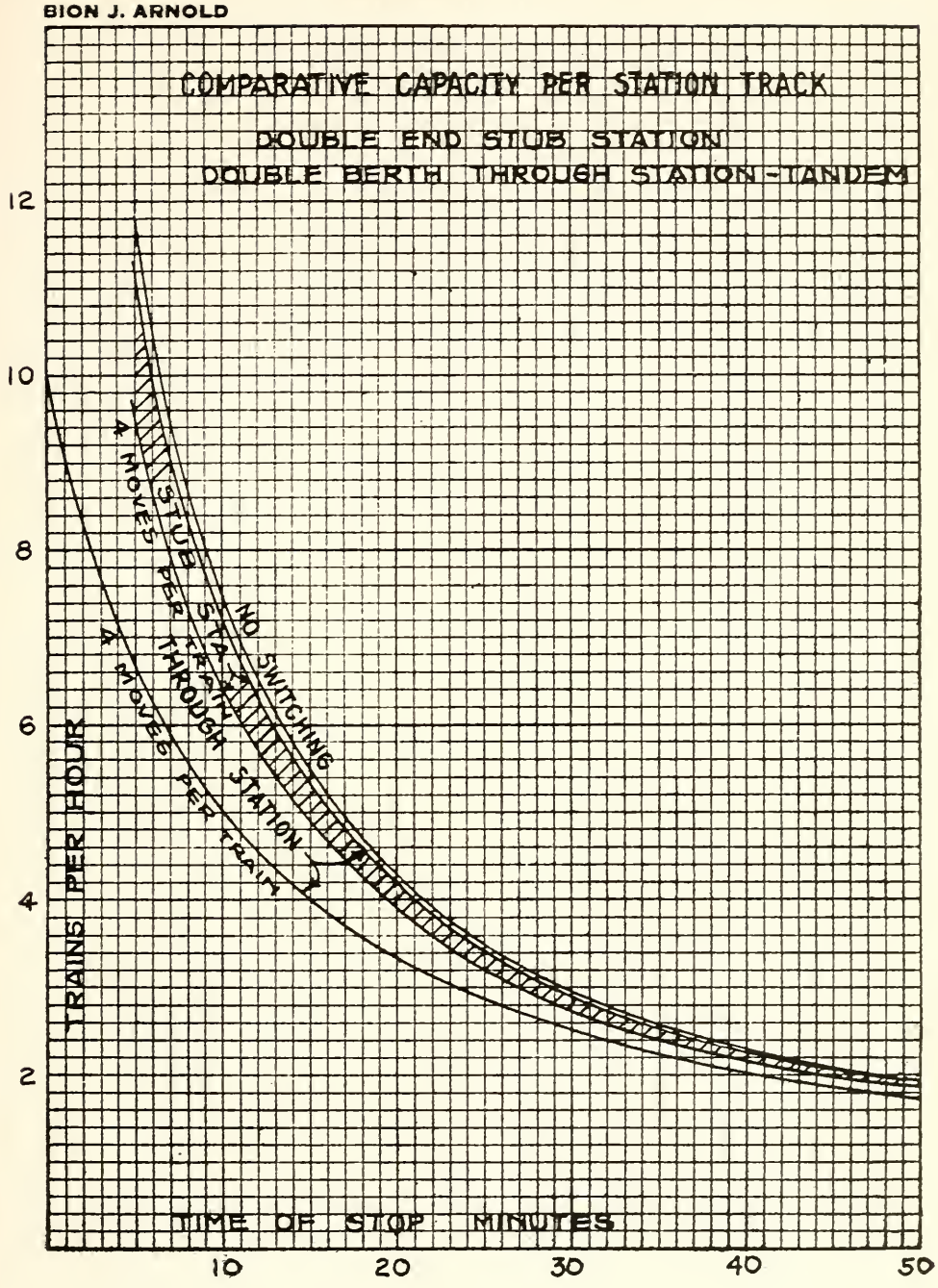

FIGURE 22. COMPARATIVE CAPACITY, DOUBLE END STUB AND DOUBLE BERTH THROUGH STATIONS.

A comparison of the relative merits of through and stub stations may fairly be made on this basis, inasmuch as both stations occupy the same area. For operation which involves no switching the through type has a slightly greater capacity, but considerable switching decreases the capacity of the through much more than it decreases the capacity of the stub station (shaded).

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regular train moves. The provision of "drill" tracks, independent of the regular throats, for use in switching, and the location of coach and express tracks on each side of, or between out and inbound main lines will tend to reduce this cross movement to a minimum.

In Fig. 23 the capacity of a stub station throat track is shown for various proportions of through and suburban traffic and various switching conditions. While there will be wide variation in these quantities in various stations, due to different track layouts and operating methods, the values shown may be taken as typical. The essential point is the reduction of throat capacity and consequent delay to trains, resulting from the operation of many switching moves in the station throat. The reduction of from 30 per cent. to 40 per cent. in throat capacity resulting from the two extra movements required to handle trains with switch instead of road engines, illustrates the desirability of reducing switching to a minimum by making up trains complete in the coach yard whenever possible and handling them in and out of the station with their road engines.

The following diagram, Fig. 24, shows the ratio between the capacities of single throat and station tracks under several conditions. The variations in this quantity, which represents the required ratio between number of station and throat tracks, indicates the large increase in throat tracks required to serve a station, due to considerable switching through the throat.

In the through station, due to operation in one direction only over individual tracks, it will normally be possible to avoid practically all throat interference (except some due to switching moves) thus slightly increasing the throat capacity. The total number of throat tracks provided will, therefore, be slightly less in the through or loop than in the stub station.

Correction for Short Rush Periods: The train movement capacity for the rush period as shown in the accompanying

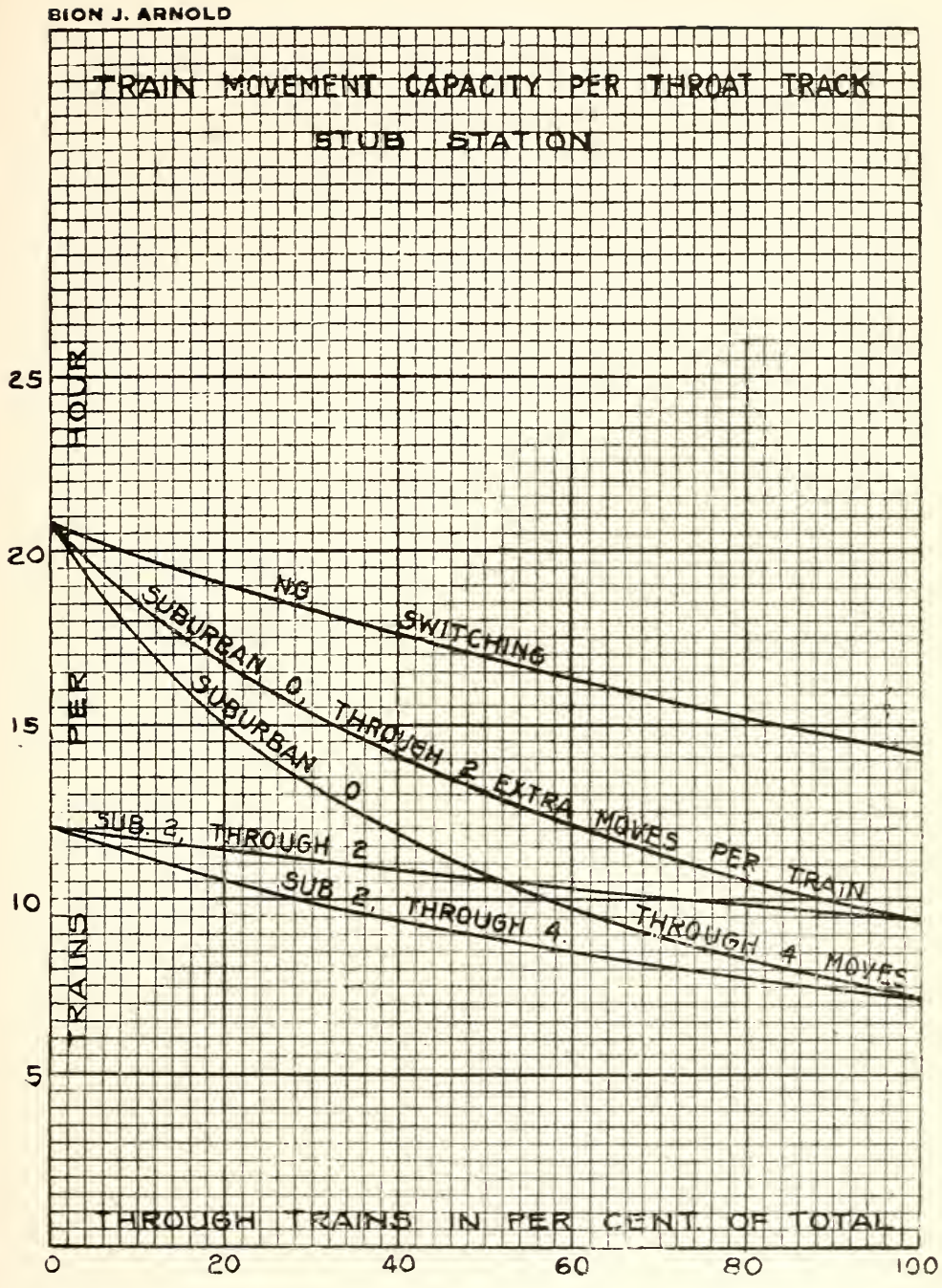

FIGURE 23. THROAT TRACK CAPACITY—STUB STATION.

Excepting speed and train length, the amount of switching and cross movement necessary are the most important factors affecting throat capacity. In this figure is shown throat capacity, with different amounts of switching and a variable traffic ratio. The decrease of over 50 per cent in capacity due to switching movements indicates the need of avoiding them. The cross movement assumed is based upon observations made in the North Western and La Salle Street stations.

diagrams, is based upon a uniform peak load of one hour duration and may fairly be applied to large union stations. In the smaller stations accommodating only a few roads, however, the maximum rush period may last for a shorter time, so that the capacity required, based upon train movement for an entire hour, will not be sufficient to handle the short peak load. Consequently, the values shown in the diagrams should be applied only to the train movement during the actual peak, or else a percentage added to cover variation within the maximum hour.

Maximum Use of Terminal Facilities: While the above study has developed a method of determining the maximum capacity of a station, the study has at the same time been based upon the most efficient methods of operation. Outside of the interlocking the important factors involved are:

1 The location of coach yards and sidings with respect to the amount of extra switching necessary through the main throat.

2 Method of handling baggage, mail, express and perishable light freight with reference to the station platforms.

3 Kind of motive power employed.

The results of these studies of throat interference due to extra switching indicate that terminal development is influenced to a large extent by the available location for coach yards, a fact that seems to have been partly lost sight of by some who have discussed this subject. The economic problem to be determined for each individual location is defined by relative value of lands occupied and the demands against this space for other terminal facilities.

In Chicago most of the coach yards are located in inexpensive territory from 3 to 5 miles distant from the terminal and trains are there made up complete. (See table 14, appendix.) North Western outbound trains back into the station from these yards under a road engine with the result that little delay due to extra switching moves is encountered. On

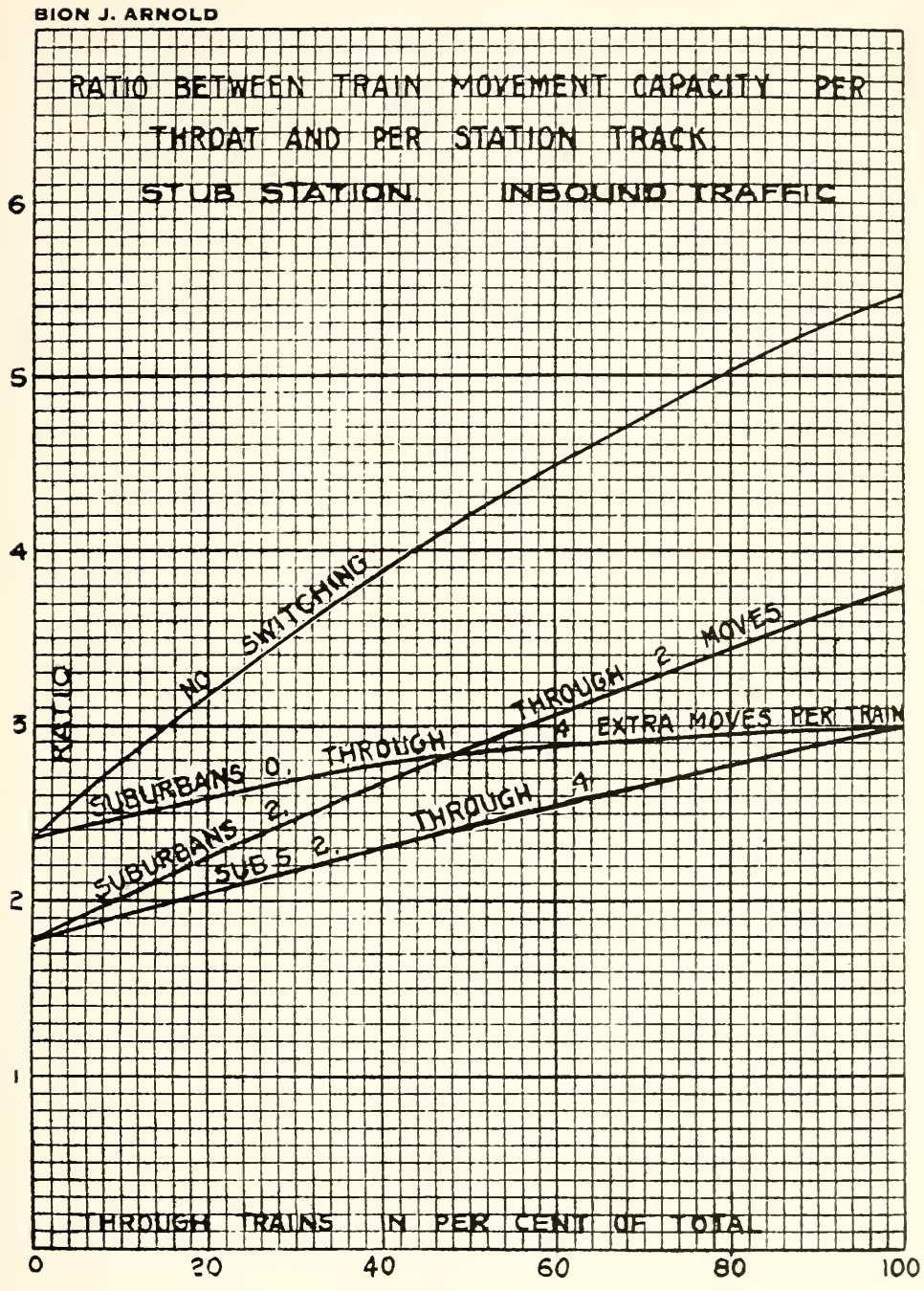

FIGURE 24. THROAT RATIO—STUB STATION.

Based upon Figs. 20 and 23. Showing the variation in ratio of throat to station track capacity (equal to most effective throat ratio), with different amounts of switching and variable proportions of through and suburban traffic. The small ratio required for suburban service and the large ratio for through service, as well as the decrease caused by switching movements, are evident from the diagram.

the other hand the long back haul to the Lake Shore coach yards encourages the use of the side tracks at the La Salle terminal for suburban coach yard space and much interference results.

While the ideal plan from an operating viewpoint would be to provide coach yards, at least for suburban equipment, immediately back of the train shed and independent of the station throat tracks, thus almost entirely avoiding throat interference, this location is usually too costly and instead "drill" tracks are often installed paralleling the main tracks far enough in the rear of the station to permit switching operations without interfering with the main line tracks.

Ordinarily, switch yards are located in comparatively inexpensive territory but as near to the terminal station as possible. Here, "dead mileage" or "back haul" is necessarily incurred, but possibly at less total expense. The pressure for extra space around the terminal itself obviously argues for the distant location for the coach yards; nevertheless, in view of the prompt dispatching necessary for suburban trains, and especially where excessive peak loads must be handled with a limited amount of equipment, a forward location is preferable for the suburban coaches, as in the case of the Grand Central terminal, New York.

In such cases, when the cost of land is excessive, development of air-rights for commercial uses and office buildings is resorted to with excellent results. The Hudson and Grand Central terminals, New York, are excellent examples of such efficient use of air-rights.

As to the location of baggage, mail and express handling facilities, throat interference due to extra switching may largely depend upon the individual layout. There are two general arrangements used:

(a) Island platforms between tracks in the train shed, either the same or separated from passenger platforms.

(b) Separate unloading platforms along standing tracks at the side of the property.

The first has the advantage of avoiding extra switching but the standing time on the station tracks is somewhat longer than actually necessary for handling passengers. It also has the disadvantage that baggage and passengers are indiscriminately mingled unless separate platforms are used. Furthermore, some baggage handling on the passenger platform can hardly be avoided.

On the other hand, the provision of all handling facilities except passenger at the side of the station has the advantage of avoiding interference with passengers but greatly increases the size of the throat necessary for long distance trains entering a stub terminal. For example, four extra switching moves per train through the interlocking plant reduces the capacity by approximately one-half which can only be made up by a more complex throat layout. In a pull-through station it is possible to take greater advantage of the sidings to reduce the standing time of inbound trains. For outbound trains a long standing time is a great convenience to passengers so that little saving would result in this case.

Modern practice seems to favor island platforms for all quick baggage and express with reserve sidings for carload lots and for overflow at rush periods. That high efficiency is obtainable with this plan is indicated by the provision of a mechanical handling plant in the Pennsylvania design, operating the full length of the station platforms independent of walkways. In other modern designs separate island platforms between passenger platforms have been proposed for baggage handling exclusively.

While this plan requires more station area per track, it is usually expected to replace finally the supplemental platforms by a mechanical plant and install additional standing tracks. This recognizes the necessity of more efficient methods as traffic increases.

Electrification: Electrification studies do not occupy an important part of this preliminary report for the reason that

the matter has long been under consideration by a duly authorized committee of the Chicago Association of Commerce appointed for that purpose; and the approaching completion of the committee's work would appear to make unnecessary any great amount of work along the same lines until the result of the committee's decision shall be made known. There are, however, three essentials that should be adhered to in any future terminal plans for Chicago, as follows:

1 Any terminal studies at this time must be made with electrification in view for passenger, and freight traffic entering the city.

2 The handling of trains by electricity presents two entirely different problems in through and suburban traffic respectively.

3 While suburban train movements will be greatly facilitated and station capacity increased by electrification, the capacity of a terminal for long distance trains will be little affected by electrification except in facilitating yard movements and the provision for smoke removal.

It has been the history of all progress in transportation methods that more and more intensive use of facilities has occurred through more efficient means employed. Given a site of ample dimensions for the present and near future, it is reasonable to expect a more and more efficient use accompanying the rebuilding that is bound to take place from time to time, due to change in the art if for no other reason. This, for example, will be the result of general terminal electrification.

SUPPLEMENTARY ANALYSIS OF CAPACITY.

PRESENTING DETAILED OBSERVATIONS AND METHODS UPON WHICH THE FOREGOING DISCUSSION IS BASED.

STUB TERMINALS.

Capacity per Station Track: The train handling capacity of a station track is determined by seven factors:

(a) Time for towerman to set up a section of the route.
(b) Time to run into the station from the fouling point.
(c) Standing time at the station.
(d) Time to run out of station past fouling point.
(e) Time of effective interference.
(f) Time of interference due to switching movements.
(g) Character of service (through or suburban).

Of these, b and d, were obtained by observing train movements in the La Salle and C. & N. W. stations. Observations in each of the stations were generally consistent and occasionally varied 20 per cent. from the average for that station.

Time of Stop: The standing time is the most important factor influencing the station capacity. For inbound trains this is largely dependent upon whether large quantities of baggage, mail and express are unloaded at the station platform or at special sidings. In this study it is assumed that all such material is unloaded at the station platform as is the practice at the present C. & N. W. terminal. Observations taken at this station show the standing time for inbound suburban trains to be slightly less than three minutes, and a general average of from 12 to 18 minutes for through trains.

For outbound trains, the standing time, where not determined by the loading of express and mail, is largely a matter of judgment. If it is considered that a train should stand only long enough to load its passengers, the stop will be fixed by time necessary for passengers to walk from the waiting room to the train. The distance from the waiting room to the coaches as well as the time required for punching tickets at the gates is then an important factor. If, however, as is

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considered herein, good service requires a longer stop at a terminal station than the bare time to load, these considerations are no longer determining factors.

It is assumed for this analysis that a standing time of 30 minutes for through and 12 minutes for suburban trains is a reasonable allowance.* Both quantities, particularly the latter, may be materially reduced in emergencies, the time chosen being considered a compromise between maximum capacity on one hand and maximum convenience to the public on the other.

Interference: It is impossible to any more than approximate the time lost on other station tracks due to interference caused by train movements from a given track. In a large terminal the number of station tracks blocked by an average move will equal the throat ratio. Since the blocking of a track will create delay only if a movement is interfered with, the actual number of tracks blocked must be reduced in the proportion of the time of movement over a track to the total time of occupancy. For haphazard distribution of trains this approximates the number of interferences per movement which by careful handling of traffic can be reduced at least one-half.

Switching Interference: For outbound trains all switching will normally be done during the standing or loading time of the train and it will usually be possible to so time the switching moves as to avoid most effective interference with station tracks. For inbound trains some of the switching must be done after the removal of the coaches so that this will not generally be possible, since delaying the switch moves will in turn delay clearing the track and thus increase the occupancy time per train. The amount of switching will be determined by the operating practice but the range probably should not exceed 0 to 4 extra movements per train.

Effect of Train Length: It is assumed that in the stub

*Applies to rush hour conditions and not to night trains.

station normal operation requires the berthing of only one train per track to avoid the excessive walking distance from the rear train in two berth operation. With this assumption, the train length does not affect any factor influencing the capacity of a station track except the time lost in interfering moves which is almost directly proportional to the train length. The average suburban train is assumed to consist of five and the average through train of eight cars.

Allowance for Irregularities: Due to the fact that trains cannot be operated with mathematical regularity it is necessary to add a factor to the occupancy time per train to allow for late arrivals and other unavoidable irregularities in movement.

The amounts added are:

Inbound through trains 20%
Inbound suburban trains 10%
Outbound trains 5%

Throat Capacity: In the calculation of throat track capacity it is assumed:

All important switches and crossings within the throat to be protected by interlocking signals.

Coach yards located beyond throat interlocking so that all train and drag movements must pass through the throat.

Route set up in sections rather than as a whole from the interlocking limits to the station.

Train movements normally not to be stopped in the throat interlocking after entrance.

Average train length: suburban 5 cars = 400 ft., through 8 cars = 700 ft., switch movement 1 car = 150 ft. (including engine).

Operation unidirectional as far as possible over individual throat tracks.

The minimum interval between trains following each other over a single throat track will be fixed by the limitation imposed at a switch or crossing. A train passing over a switch will block it for use by another movement from the time the

forward end reaches the fouling point (about 75 feet from the switch) until the rear end clears the fouling point on the other side. That is, the switch will be blocked for the time required to move a train length plus 150 feet. In addition to this, a following train must be at least its braking distance behind the signal when it is cleared in order to avoid stopping, and a time allowance must be made for the interlocking operator to throw the switch and clear the signal.

Observations at both the La Salle and North Western stations show that the average movement occupies 1.35 throat tracks—that is, that every third move uses two tracks. Total time of occupancy per movement is therefore 1.35 times the occupancy period per track. Ten per cent. is added to compensate for irregularities in train movement.

The factor 1.35 varied less than 4 per cent. in a series of observations covering three rush periods, but in spite of this small variation, the figure can be considered approximate only, since different station layouts and operating methods will necessarily cause some difference in throat track interference. The amount of cross movement will also be largely affected by the amount of switching done in the station yard and the location of baggage, express and mail sidings.

Results: The results of this analysis are shown in Figs. 19 to 24, which are analyzed on pages 116 to 126.

Constants Used: The following table shows the figures used in computing stub station and throat track capacity:

ASSUMED FACTORS INFLUENCING CAPACITY—STUB STATION.

STATION TRACKS.

	In	Out	In	Out
Time for setting switches and signals and for engineer to observe signals	20 sec.	20 sec.	20 sec.	20 sec.
Time to run braking distance	9 sec.	9 sec.	7 sec.	7 sec.
Time to run into station from fouling point	85 sec.	85 sec.	70 sec.	70 sec.
Standing time	15 min.	30 min.	3 min.	12 min.
Time to run out of station and clear fouling point	80 sec.	80 sec.	65 sec.	65 sec.
Equivalent time of interference with other tracks	45 sec.	45 sec.	35 sec.	35 sec.
Time of occupancy	19 min.	34 min.	$6\frac{1}{4}$ min.	$15\frac{1}{4}$ min.
Add for irregularities	20%	5%	10%	5%

THROAT TRACKS.

	Through Trains:	Suburban Trains:
Setting switches and signals and observing signals	20 sec.	20 sec.
Time to run braking distance	9 sec.	7 sec.
Time to run train length plus 150 feet	56 sec.	33 sec.
Time switch is blocked	85 sec.	60 sec.
Allowance for interference—35%	30 sec.	21 sec.
	115 sec.	81 sec.
Total for each train (two movements)	230 sec.	162 sec.
Add for each switch move	60 sec.	60 sec.
Add for irregularities	10%	10%

PULL-THROUGH TERMINALS.

Single Berth: The time of occupancy of a station track in a single berth through station differs from that of the stub station in three of the seven factors involved:

(a) Since individual station tracks are operated entirely in one direction and a throat track will exclusively feed several adjacent station tracks, all operated in the same direction, the interference of one move with other

tracks can be almost entirely avoided during normal operation.

(b) The back haul necessary in the stub station before a station track is cleared, is avoided in the through station where the "proceed with caution" signal can be given a following train immediately after the leading train starts from the platform.

(c) It is possible by careful timing of switch moves to avoid all delay, either direct or by interference.

The combined saving from the first two factors amounts to from 1½ to 2 minutes while the saving from the third will vary with the number of switching moves made.

Using four extra moves per train the single berth through station will have a capacity for outbound service with a three minute stop, nearly 75 per cent. greater than the stub station, but only 25 per cent. greater with a fifteen minute stop.

With no switching the additional capacity provided by the through station will be from 35 per cent. to 10 per cent. less than in the stub station with three and thirty minute stops respectively. (Fig. 21.)

Double Berth: A—Tandem Operation—both trains on one track headed in the same direction:

The time of occupancy per pair of trains (perfect pairing assumed) will be the same as the time per train in the single berth station plus the time required to run the length of a berth and the safe interval between the pair of entering trains. With no switching this brings the capacity per station track of the double berth through station to practically twice that of the single berth stub station, or equal to the double end stub station. (Fig. 22.)

If through operation is used exclusively, however, it becomes difficult to execute switching movements for the rear train of a pair without excessive delays. The reduction in capacity for the double berth station due to 4 extra moves per train is from about 60 per cent. with a three minute stop to 20 per cent. with a thirty minute stop as compared with re-

ductions of from 14 per cent. to 7 per cent. in the stub station under similar conditions, showing the double end stub to be the more efficient station.

B—Double crossovers provided between berths on each pair of tracks. All trains headed out of station:

Operation of a double berth through station in this manner will avoid the delays due to switching encountered in tandem operations. However, one berth must always be vacant, thus decreasing the capacity 25 per cent. and a delay equivalent to the backhaul in the stub station will often be encountered. Also, the time required for every train to run into a forward berth at the low speed required in the station adds considerably to the occupancy time. The capacity per station track with this method of operation is less than for either the tandem double berth through station or the double end stub station.

Throat Capacity: In the operation of a through station it should normally be possible to avoid practically all throat interferences due to regular movements. This would apply to only part of the switching moves. On this basis the throat capacity per track in a through station is from 30 per cent. to 10 per cent. greater than in the stub station depending upon the amount of switching performed.

Loop Stations: The capacity per station track of a simple loop station is the same as for a through station. But due to one way train operation, any reverse switching through the throat tracks causes serious interference which may be largely avoided in the other types.

Operation of a loop terminal, unloading trains on one side, and running to the other side, loading and immediately starting on an outbound trip, is manifestly impossible for through trains whose coaches must be cleaned between trips.

Suburban traffic is so unbalanced during the rush periods that the double operation would be impossible except in a few cases. Thus the present suburban traffic outbound during the

evening rush hour is five times the inbound, so that only one outbound trip in five could be made by a train which had just arrived.

SECTION 8.

ANALYSIS OF TERMINAL PLANS PRESENTED.

In order to facilitate consideration of the numerous plans proposed and presented herein, certain definite methods of classification and analysis have been employed which have largely influenced opinions expressed in this report. This analysis, of course, cannot be rigidly applied to plans which have been presented in general rather than in concrete form; but the principles involved are for the most part definite:

1. Segregated as to passenger and freight terminals.
2. Consideration of suburban as distinct from long distance traffic.
3. Ultimate or maximum capacity of terminals expressed in train or car movements per maximum hour.
4. Relative utilization of ground area as related to investment involved.
5. General track arrangement as affecting capacity and economical operation.
6. Effective location of station facilities with respect to convenience and prompt movement of trains and passengers.
7. Adaptation of site to future needs.
8. Location of freight terminals for maximum convenience consistent with proper development of a city plan.
9. Relation to street and city plan.
10. Resulting interference with passenger facilities and street plan.
11. Possibilities of maximum commercial development of freight sites and necessity for enlargement.
12. Limitations of freight entrance routes.
13. Relation of the regrouping of roads to the feasibility of electrification and minimizing the total investment.
14. Concurrent and divergent features of plans presented.

Plans Presented in Approximate Order of Date of Presentation.

1. Mr. Frederick A. Delano.
2. Commercial Club of Chicago.
3. Chicago & Western Indiana Railroad.
4. Mr. Jarvis Hunt.
5. Union Station Company (Pennsylvania).
6. Chicago Plan Commission.
7. Messrs. Pond & Pond.
8. Messrs. Guenzel & Drummond.
9. Illinois Central Railroad.
10. Schematic Plans by Messrs: Lemerich, Bessey, Goetz, Gibson, Sattley, Sanford.

Concurrent and Divergent Features: Summarizing very briefly all these various plans it appears that most of them recognize without question the pressing necessity of expanding the present business district, the improvement of the street plan, the rearrangement of the railroad holdings, the straightening of the river, the more effective use of freight properties, the development of river frontage and its freight facilities, the elimination of unwieldy structures constituting obstructions to city growth, and the assumption that the roads will agree to a reasonable program as affecting their present holdings and groupings.

But conspicuously divergent views seem to be held by the Pennsylvania interests in their adherence to their present advantageous locations irrespective of the expressed willingness of the other roads to concur in a program of recedence, also by various proponents as to the comparative advantages of loop and through vs. stub terminals, and the desirability of

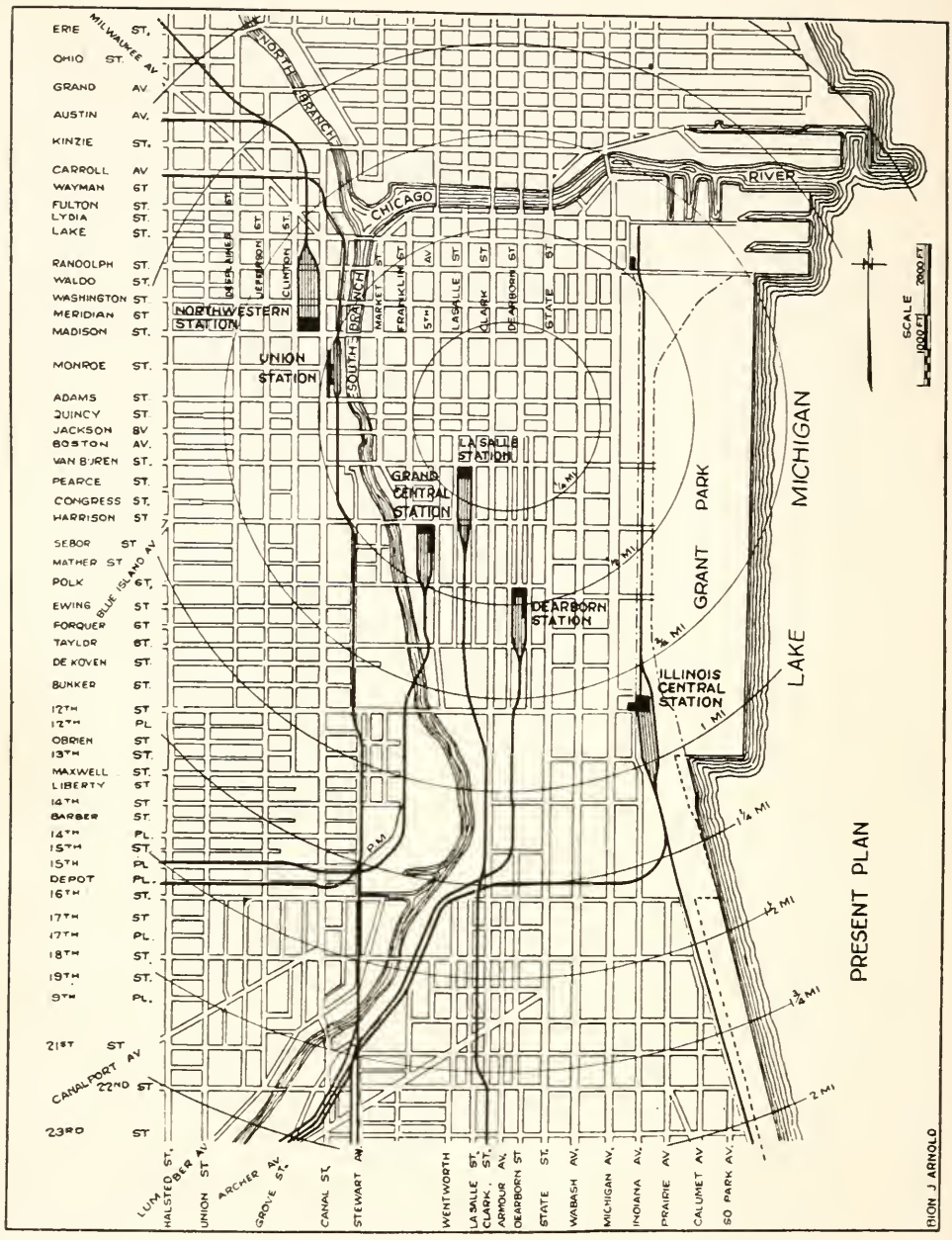

FIGURE 25. PRESENT PASSENGER STATIONS.

Showing the location and means of approach to the six passenger stations now used in Chicago. Of these, three—the Union, Dearborn and Illinois Central terminals—have about reached their capacity and must soon be replaced. The remainder have sufficient facilities for some time to come.

one large terminal as distinguished from several independent terminals, also as to the location and development of freight facilities, both house and yard, with reference to the business

district. Team track space for the most part appears to have been neglected.

Thus most of the plans agree in some features, but radically disagree in others. A short description and analysis of each plan follows:

Original Delano Plan—Fig. 26: Presented in 1904, by Mr. F. A. Delano, (then not engaged in railroad work), and since embodied in its principal features in the Chicago & Western Indiana R. R. proposals. The underlying feature was the alignment of all terminals east of the river on 12th street (or possibly on Taylor street), and the "intensive development" of present realty holdings north of 12th street for office buildings and commercial development in warehouses or loft buildings, with tracks beneath the streets for handling freight on the present street level. In these proposals, the stub terminal arrangement was employed with all passenger tracks elevated to the viaduct level as proposed for 12th street, *i. e.,* to about the same level as main line track elevations throughout the city.

An important feature of the "intensive development" north of 12th street by this plan was the provision for some additional north and south streets and the opening of some existing north and south streets now blocked by railroad property. Some regrouping of the railroad entrances was necessary in order to avoid grade crossings and to bring all the roads to 12th street where six unit stations similar in plan and arrangement were provided side by side.

Mr. Delano advocated the straightening of the Chicago River below 12th street in order to provide for these six stations which would house all of the roads entering Chicago except the Illinois Central and the North Western which would retain their terminals as then located. Suburban and long distance passengers were to be handled in the same stations.

This plan allows the business district to expand somewhat

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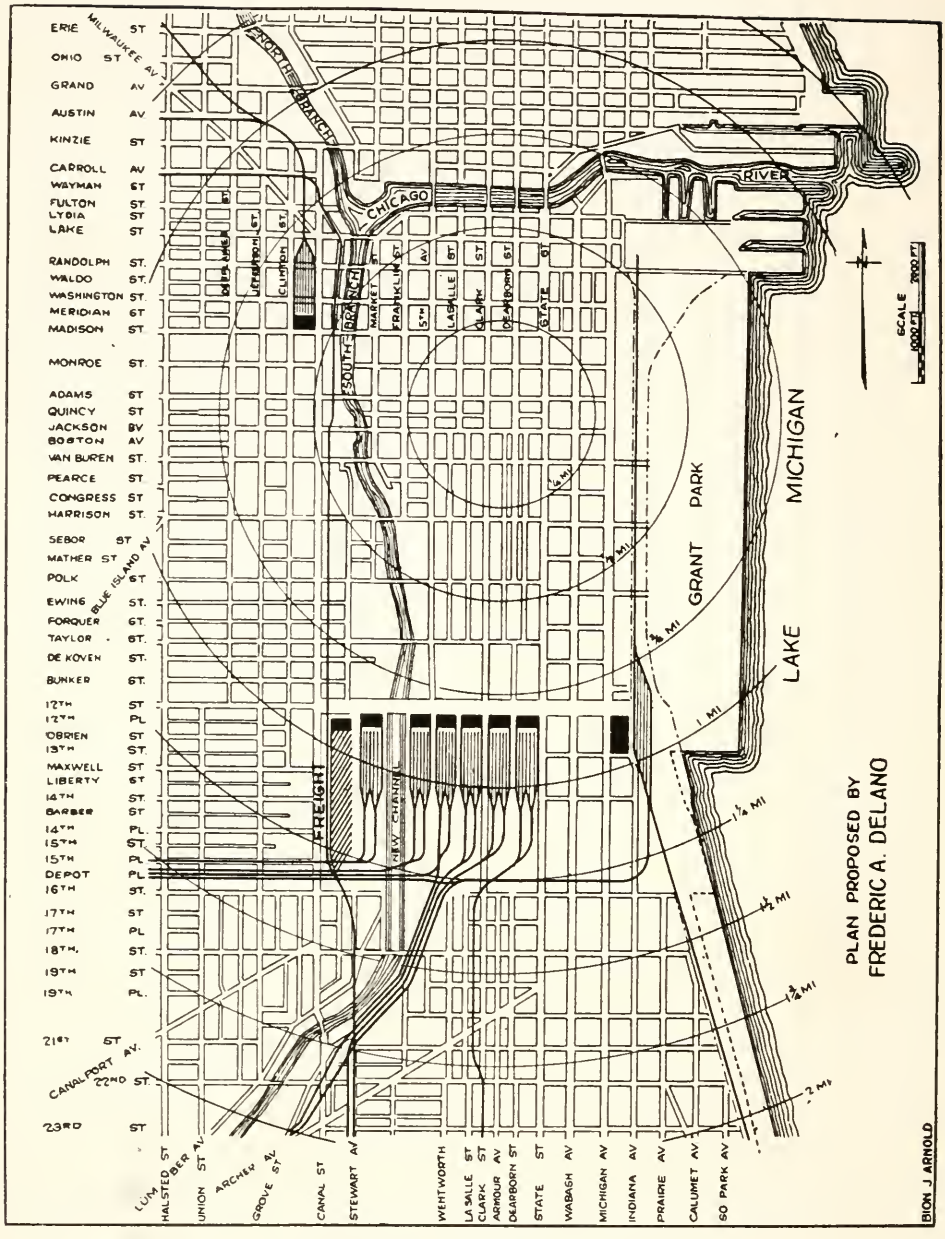

FIGURE 26. DELANO PLAN.

Originally presented in 1904. This plan proposes straightening the river below Taylor Street and the building of six unit stations of the stub type fronting on 12th Street, one west and five east of the river. All stations are to be elevated above street level. Intensive development is proposed for realty holdings north of 12th Street into office and loft buildings, or warehouses with basement facilities for freight handling. Provision is made for the opening of several north and south streets which are now blocked by passenger terminals.

by moving the railroad barrier southward a few blocks, not, however, sufficiently reducing this barrier. It does not

provide enough new thoroughfares or provide for a separate method of handling suburban traffic. The proposals were made in a general way only and were not worked out in detail.

Plan of the Commercial Club of Chicago—Fig. 27: As the result of a comprehensive study carried out under the auspices of the Chicago Commercial Club by the late Mr. D. H. Burnham in 1906-08, railroad terminal plans were presented embodying the following features:

1. Four unit stub passenger terminals lined up at 12th street, similar to the original Delano plan, having tracks elevated to the viaduct level with intensive development of freight properties to the north, the Illinois Central remaining on the lake front but moved to 12th street.
2. Straightening of the Chicago River south of 12th street.
3. A line of commercial freight buildings along the west bank of the South Branch of the River with *depressed freight tracks.*
4. A series of passenger terminals between Canal and Clinton streets on the unit plan; one proposed with elevated entrance tracks, and one alternative with depressed tracks.
5. These latter unit stations grouped about a central axis in Congress street (projected) which forms the axis of the civic center and the entire proposed city plan.

Great stress was laid by Mr. Burnham upon the necessity of adherence to a definite City Plan in all future railroad and street development.

This Commercial Club Plan was never adopted *in toto* either by the City of Chicago or the Chicago Plan Commission thereafter created by the city administration to consider the Burnham City Plan; to appraise the practical value of its proposals, and to recommend to the city a plan of procedure through which the essentials of the plan might be carried out step by step while still conserving the desirable features of the original idea.

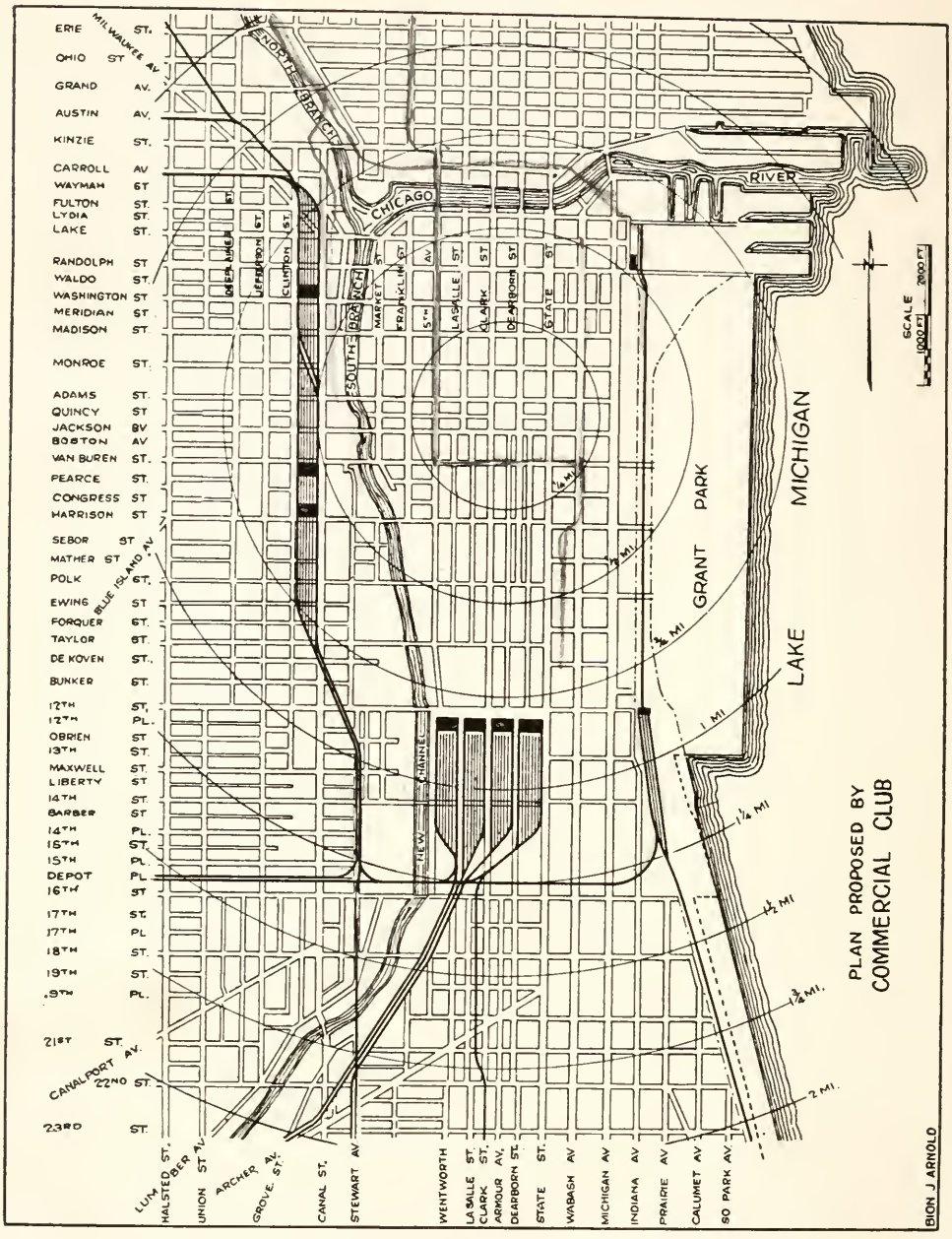

FIGURE 27. COMMERCIAL CLUB PLAN.

This plan, developed by the late Mr. D. H. Burnham, proposes a series of unit stations along the river between Clinton and Canal Streets, with either depressed or elevated tracks, a group of four stations fronting on 12th Street viaduct, between Fifth Avenue and State Street, and a station at 12th Street and the lake front for the Illinois Central; the river to be straightened from 12th to 16th Streets. Great stress was laid on the necessity of adherence to a fixed City Plan. This scheme seems to be the forerunner of the unit plan of station development.

This plan does not provide for separate suburban development, nor allow for sufficient expansion of the business district to the south or west.

Chicago & Western Indiana Plan—Fig. 28: To a great extent this plan was a development of the proposals originally made by Mr. Delano. It contemplates the location of two stub terminals south of and fronting on 12th street, with the River straightened between 12th and 16th streets: One of these was located between State and Clark streets for the Western Indiana roads, one for the LaSalle Station group of roads between Clark street and the river, and one between the River and Canal street for the Union and Grand Central groups of roads. The Illinois Central and North Western would occupy their present locations.

This provides for a general group of terminals, each unit conveniently located with respect to the others on 12th street, and with tracks on the viaduct level of 12th street.

The property north of 12th street now owned by the railroads would be developed intensively for freight houses and commercial buildings with tracks below the street; freight driveways at about the street level and elevated driveways above them, on the viaduct level, possibly with inclines at Polk street and Taylor street.

The Western Indiana terminal as proposed would open no new streets through to the south or west, but by straightening the river 5th avenue would be opened up as a through street, becoming a "River Road" south of 12th street. The river improvement, however, is not essential to the main project.

The plan, as the two previous ones, does not provide for sufficient improvement of the street system nor expansion of the business district, and the development of an independent suburban service, is apparently not contemplated.

The Hunt Plan—Fig. 29: Mr. Jarvis Hunt, advocating consolidation of terminals, proposes a single Union terminal

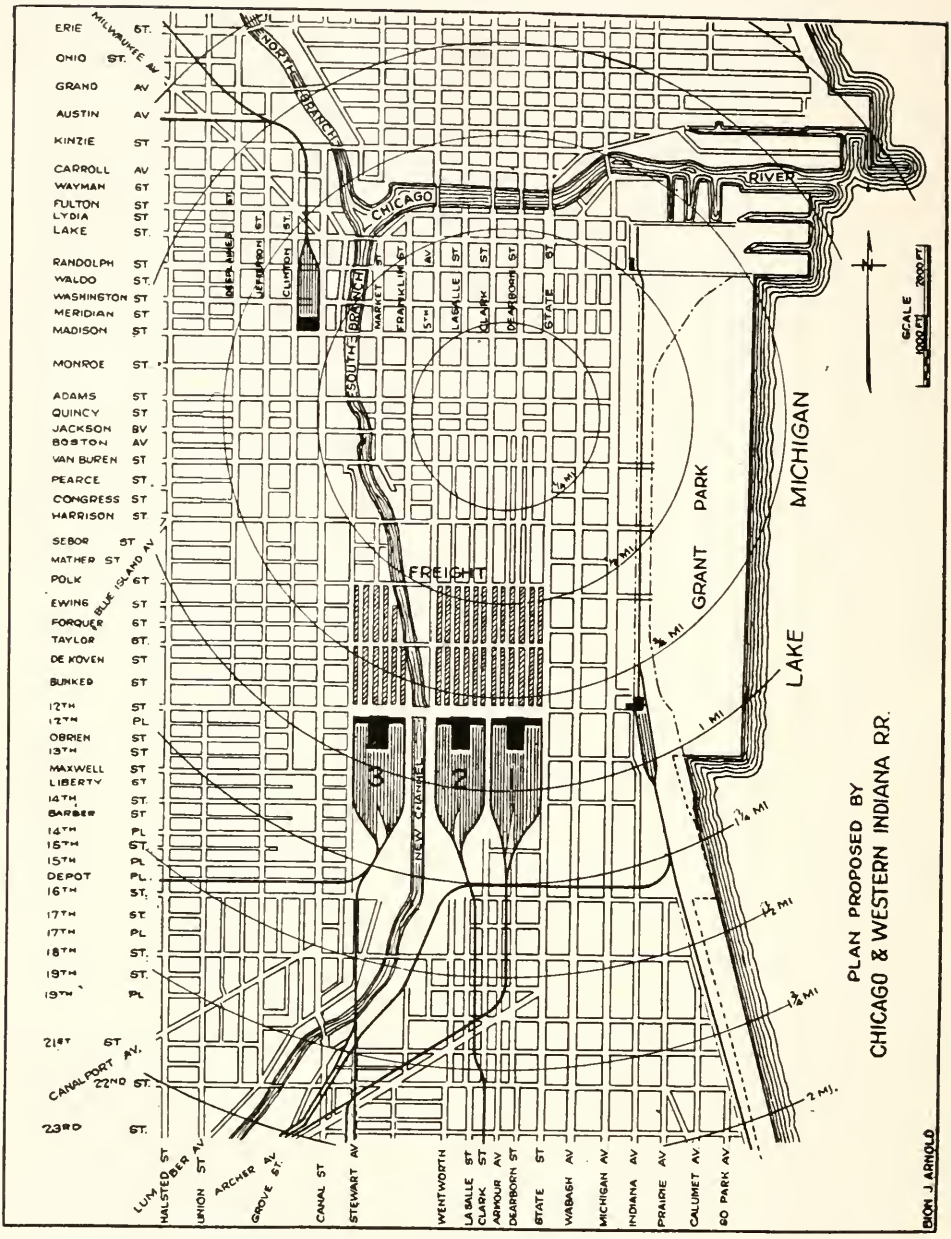

FIGURE 28. CHICAGO AND WESTERN INDIANA R. R. PLAN.

A development of the original Delano Plan. Contemplates three new stations above the street level fronting on 12th Street: Western Indiana group between State and Clark Streets; La Salle group between Clark Street and the river (straightened from 12th Street to 16th Street); Union and Grand Central groups between the river and Canal Street. North Western and Illinois Central traffic to be handled in their present stations. Railroad property north of 12th Street to be intensively developed with commercial buildings and freight houses served by depressed tracks.

located between 12th and 16th streets, from State street to the Chicago River, the river being relocated parallel to and 175 feet east of Canal street, from Congress street as far south as 20th street, in order to provide sufficient area for this terminal. Three main loops are proposed: one for trains coming from the south, one for those coming from the southwest, and a third for trains coming from the west. These would all be on a level above the streets, the station tracks running east and west and located in two groups 450 feet apart, within which strip is located the main station headhouse. There is proposed tentatively, another group below the street level for trains coming from the north, with approach tracks passing under the river and probably electrified. In order to avoid grade crossings between the approach tracks to the three upper loops the outbound south approach tracks would have to be placed on a gradient.

Mr. Hunt contemplates having all incoming trains use the tracks at the south side of the terminal and all outgoing trains use the tracks on the north side, thus effecting a complete separation of inbound and outbound traffic. The station building would be placed between the two groups of tracks with auxiliary facilities beneath the tracks themselves. The plan also involves a very complete and comprehensive re-routing and regrouping of railroad entrances to the city, saving mileage in almost all cases, and abandoning—for passenger purposes—some present rights-of-way.

This terminal is intended for through traffic only. All suburban traffic is to be handled around a "suburban link" or loop running parallel to Canal street and under Indiana street, Grant Park and 16th street, which route would obviously require electrification.

Freight houses are to be located south of the passenger terminal between 16th street, State street, Archer avenue, and the approach tracks to the passenger terminal from the south, which approach would be on the present Pennsylvania and

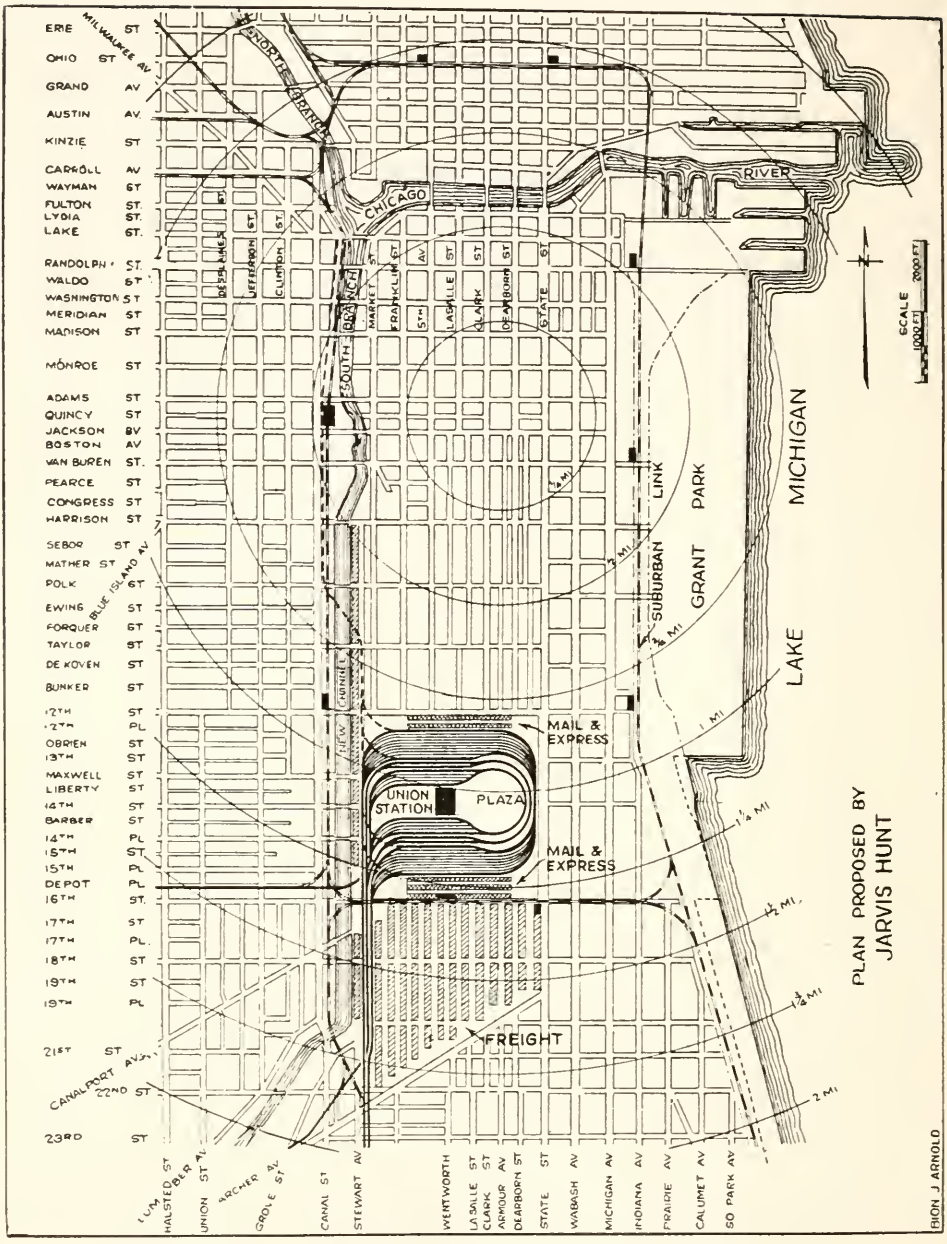

FIGURE 29. PLAN OF JARVIS HUNT, ARCHITECT.

A Union Loop Terminal for all through traffic, involving the straightening of the Chicago River from Van Buren to 20th Streets. Tracks of three of the four divisions are elevated above the street. Those of the Northern Division are depressed. Streets are opened through the terminal area. The station is divided into separate in-bound and out-bound sections and each platform has direct entrance from or egress to the street. Suburbans for all roads are handled on the depressed loop surrounding the business district. Three level freight houses are provided south of the terminal as far as Archer Avenue.

Western Indiana rights-of-way. These freight houses have two levels to be served by inbound tracks above, and outbound tracks beneath the streets.

In this plan nine additional through north and south streets are opened up, many of which, however, would be covered by freight and passenger tracks for a distance of nearly one mile. No definite provisions for team yards have been made, but Mr. Hunt proposes in a general way to locate them south of Archer avenue, which is rather too far away from the business district. It is not clear how this terminal could be operated with high efficiency, due to the bad switching facilities and the impracticability of varying the ratio of inbound and outbound tracks to suit the variations of traffic. Moreover, tracks would be necessary at five different levels, varying from sixty feet below to fifty-five feet above normal street level. The gradients and curvatures are also severe at points, and the necessity of a draw bridge at the west throat approach is a serious detriment, which could not be easily avoided unless fixed river bridges were adopted.

Although streets are opened beneath the station the plan undoubtedly does not remove the obstructions to the growth of the business district which removal is essential.

Plan Proposed by the Union Station Company—Fig. 30: A new terminal is proposed for the roads using the present Union Station, with a separate headhouse located in the block bounded by Clinton street, Adams street, Canal street, and Jackson boulevard. The station proper would be of the double stub type with tracks located between Canal street and the river, and below the river bridge approaches: one set of 10 tracks extending north from Adams street, and another set of 16 tracks extending south from Jackson boulebard. The concourse would be located at the level of the train platforms between the ends of the two sets of tracks, extending westward under Canal street to the main station buildings. The approach tracks from the south would rise to

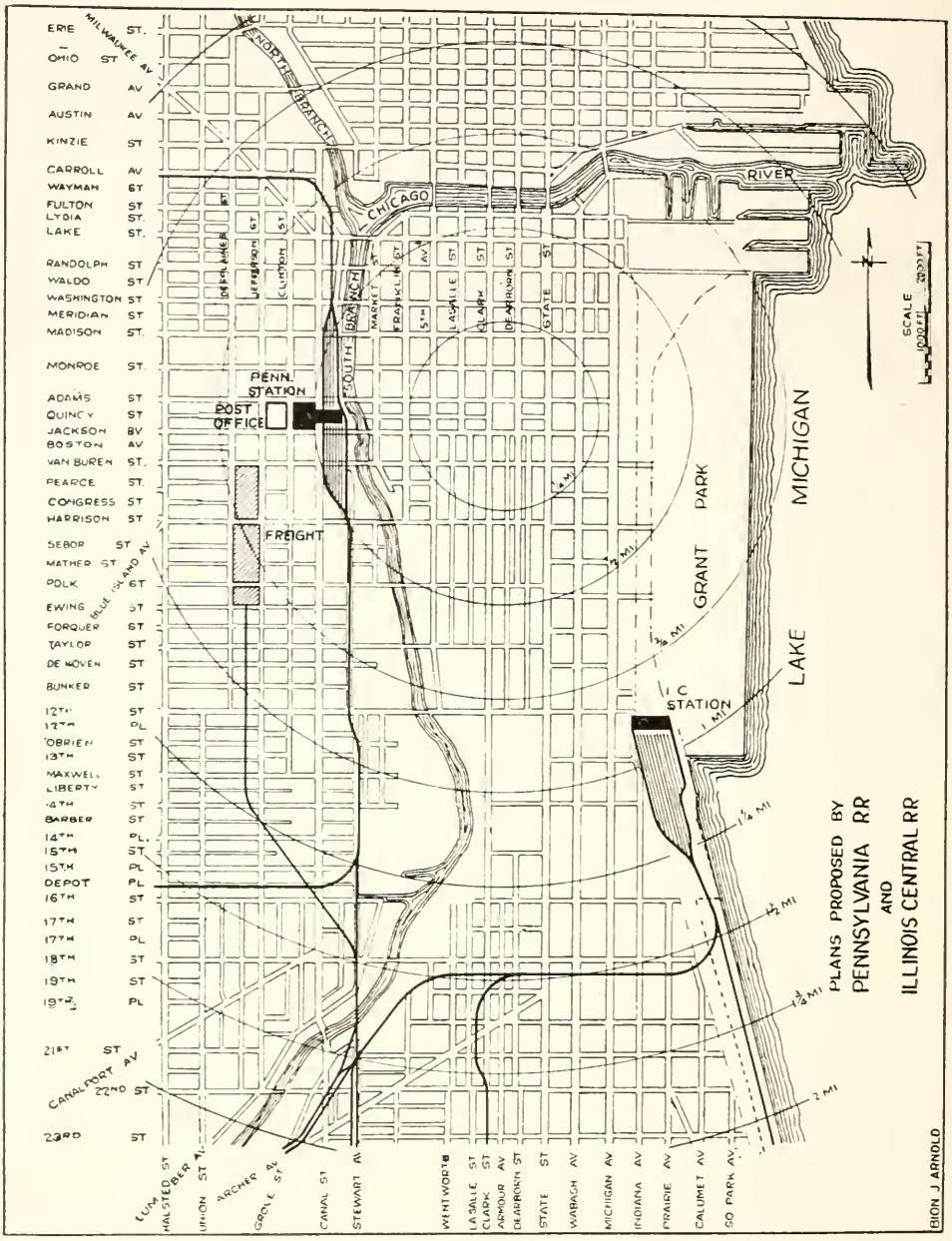

FIGURE 30. PLANS OF THE PENNSYLVANIA R. R. AND ILLINOIS CENTRAL R. R.

Proposing a new double-end stub station on the present Union Station site, with the main station building on the west side of Canal Street, between Adams Street and Jackson Boulevard. The concourse would extend from the station building under Canal Street to the train platforms. The approach tracks avoid any railroad or street grade crossings in entering the station. A new freight terminal is proposed south of Van Buren Street, between Desplaines and Jefferson Streets, having elevated approach tracks from the south. The freight plan prevents the opening of Congress Street and puts an elevated structure across Harrison Street, thus interfering with the proposed Chicago Plan. Mr. Wallace recommends that this freight terminal be moved south one block to Harrison Street, with lead tracks depressed, but not necessarily covered.

On this same plate is also shown the new station proposed by the Illinois Central R. R. on the enlarged terminal property recently agreed to by the South Park Commission.

44 feet above datum to pass above the B. & O. and St. Charles Air Line tracks at 16th street, crossing the river on a high level drawbridge and crossing above the Western Indiana tracks at 21st street. Thus two very bad present railroad grade crossings would be removed, but the present interweaving of railroad approach tracks would not be simplified at all.

This terminal plan would necessitate the removal of the present Ft. Wayne freight houses, and to provide for these displaced facilities, a new freight terminal is proposed two blocks west extending south of Van Buren street. The approach tracks would cross all streets and railroad tracks above grade, thus avoiding any railroad or street grade crossings. This feature, however, necessitates three levels of tracks above the streets near Canal and 16th streets and a maximum elevation of 53 feet above datum.

The Pennsylvania interests desire the location of the new postoffice in the block west of their proposed terminal; that is, the block bounded by Jefferson street, Adams street, Clinton street and Jackson boulevard, a site well located with respect to their own proposed terminal, but not located in any way in accordance to the best interests of the city as determined to date by the Commercial Club and the Chicago Plan Commission.

The same interests propose to leave the present Dearborn, LaSalle and Grand Central Stations temporarily in their present locations, but ultimately to move one or more of them south to 12th street, as well as the Illinois Central, as already agreed upon between this road and the South Park Commission. The proposed "Civic Center" they would locate at Sangamon and Adams streets, that is, about half a mile west of their proposed passenger terminal, and nearly a mile from the location advocated by Mr. Burnham and the Chicago Plan Commission.

These plans, while well designed from an architectural and railroad standpoint to fit the location, fail to provide the

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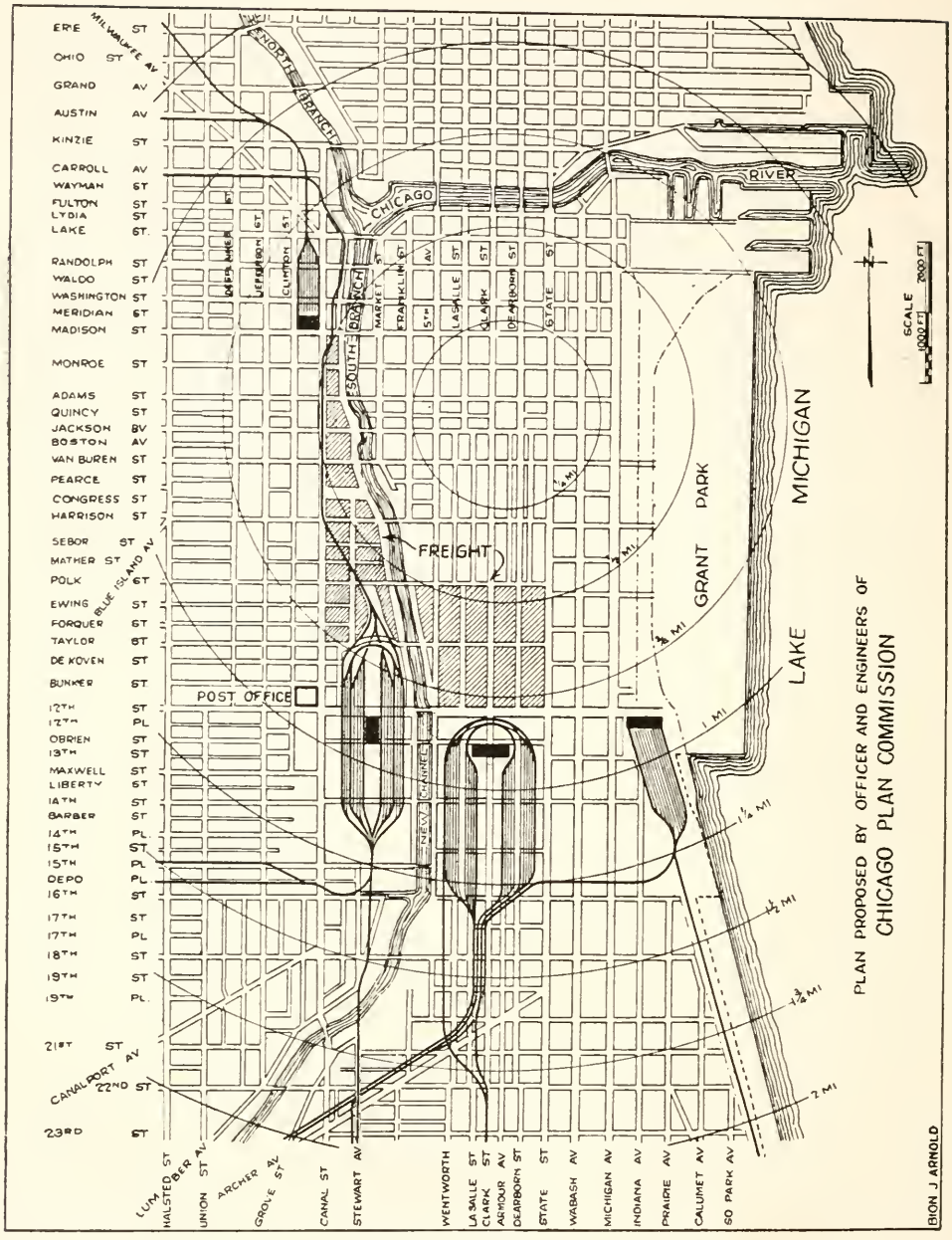

FIGURE 31. PLAN OF THE OFFICERS AND ENGINEERS OF THE CHICAGO PLAN COMMISSION.

Providing two loop terminals at 12th Street, one on each side of the river (straightened between 12th and 16th Streets). The west station, serving the Union and Grand Central groups of roads, is below street grade; that east of the river, serving the La Salle and Dearborn groups of roads, is elevated. The streets are unobstructed, the north and south thoroughfares being left open to air and sunlight. Several new streets and two river roads are opened to facilitate growth toward the south. Intensive development north of 12th Street is proposed for handling freight, for the entire length of the river on the west side and as far as Polk Street on the east. The North Western and Illinois Central terminals are retained in their present locations.

logical thing ultimately necessary for this site—a through track station. It adds further barriers to the growth of the business district westward. Practically no improvement is made in the street system; on the contrary bad humps are added to several present streets. River and bridge improvement are prevented to a large extent.

No mention is made of straightening the river. No provision is made for widening existing streets, or for opening any new streets, or streets now blocked. Practically no provisions are made for a "River Road."

Plan Proposed by the Chicago Plan Commission—Fig. 31: This plan was prepared and presented as the combined efforts of the engineers and architects of the Chicago Plan Commission under the direction of the executive officers of the Commission in order to establish the practicability of the 12th street site which at that time was generally opposed by the Pennsylvania interests. A terminal of the loop type is located south of 12th street on each side of the river which is to be straightened between 12th and 16th streets; the station west of the river being intended for the railroads now using the Union and Grand Central stations, and the one east of the river for the roads now using the La Salle and Dearborn stations. Intensive development of freight property is proposed north of 12th street, on the west side of the river for its entire length and on the east side as far north as Polk street. In addition, some commercial development of the passenger terminal site is provided for. Additional north and south streets are opened up including 5th avenue, La Salle and Dearborn streets, and the terminal tracks are spread so as to avoid serious overhead obstruction to these extended streets, thus permitting business to expand southward along these streets through the terminal. Along both river banks marginal ways are provided; 14th and 16th streets are opened as through streets together with several

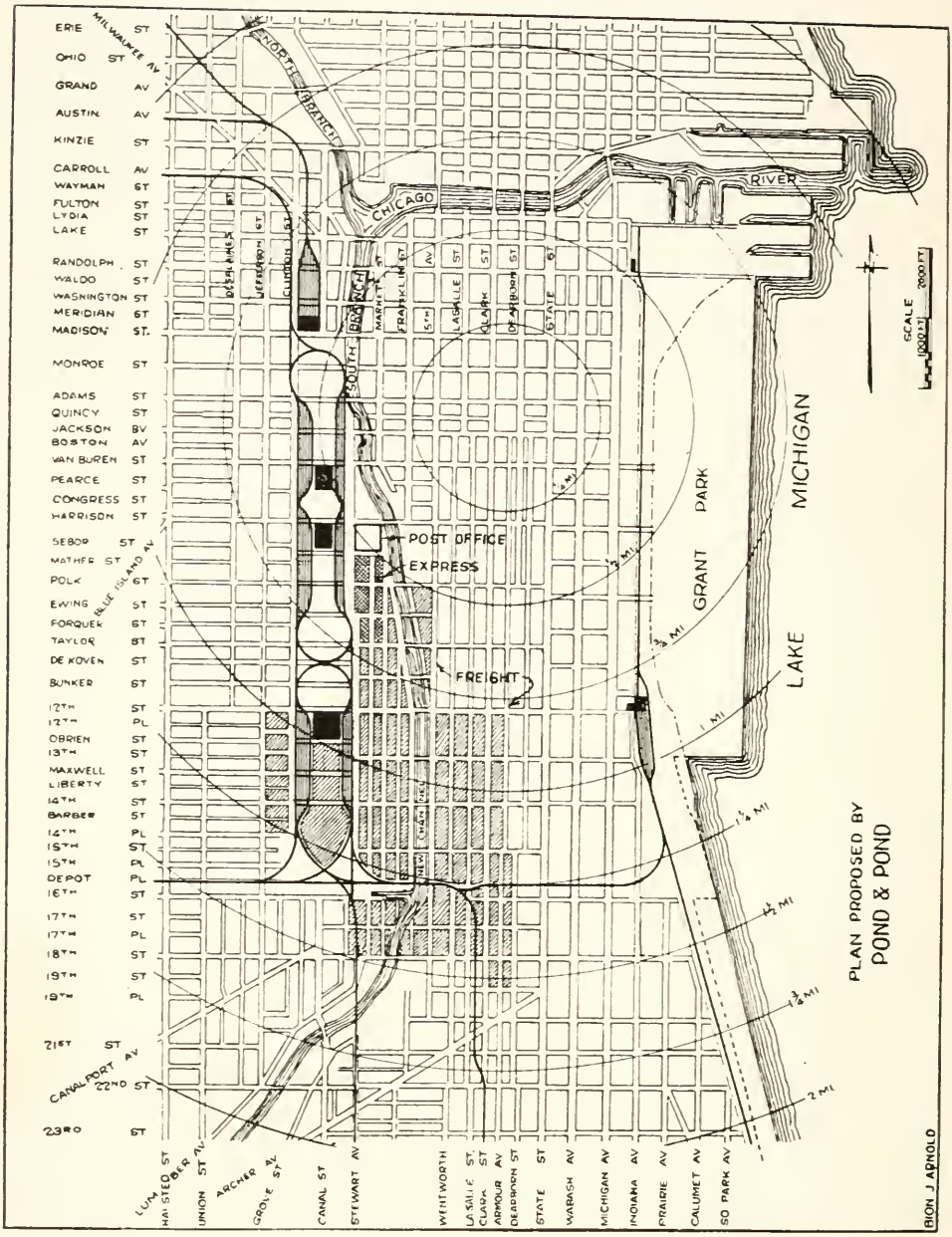

FIGURE 32. PLAN OF POND & POND, ARCHITECTS.

A series of unit stations located west of the river forming a north and south railroad highway. These stations may be constructed one by one as traffic demands without material change in units previously built. Loop operation is proposed, changing ultimately to through operation. All tracks are located upon a double-deck structure rising 75 feet above street level. Excepting Canal Street (the axis of the group of stations), no existing streets are closed or obstructed. The river is to be straightened below 12th Street. Intensive development of freight facilities is proposed up to 12th Street east, and to Taylor Street west of the river.

other short streets giving better access to the developed property.

The Union Terminal west of the river would have the tracks below the street level, covered at the north end and crossed at the south end by a viaduct approximately at the level of the river bridges; but the east terminal would have the tracks at an elevation of about 45 feet above datum, somewhat above the 12th street viaduct and just sufficient to provide access under the loop from the viaduct to the station building; there the concourse is at mezzanine level—below the tracks but above the present street grade.

While both stations provide standing tracks for the longest trains and sufficient "tail room" between the interlocking and nearest obstruction (river bridges), and grade separation is provided at main line crossings and intersections of streets, the plan appears to call for curves of very short radius, and with gradients so heavy as to be difficult to operate. Furthermore, this arrangement concentrates all traffic into two stations which, while provided with loops, are in effect stub stations without through-routing connections and so located that their capacity must in time be reached, so that other stations would then have to be located elsewhere and not in accordance with any well-defined plan so far as can be seen from the plans presented.

The Pond Plan—Fig. 32: The essential idea of Messrs. Pond and Pond appears to be a concentration of all passenger terminal facilities except the Illinois Central and North Western lines, in the form of a great railroad highway west of the Chicago River extending north and south and composed of unit stations of the loop type so located that they may be constructed one by one as traffic demands, without necessitating a radical change in the plans as each step is consummated. While loops are provided for the present, it is the intention to operate ultimately as a through-routed terminal station. The structure is double decked throughout, clear of the streets,

with main and suburban levels separately handled and with separate track platforms for inbound and outbound traffic located respectively on the east and west sides of a central station building. This elevated structure rises to a height of 75 ft. above the street level, while all roadways underneath except Canal street, are preserved at full width and with little overhead obstructions as the structures are relatively narrow. These station tracks are to be used exclusively for full train movement, all makeup being done outside at the coach yards. This ultimately requires over-lap or interchange operation.

This plan straightens the river from expediency rather than necessity; it provides for intensive freight development as far north as 12th street on the east side, and Taylor street on the west side, with a postoffice located west of the river at Harrison street. Canal street is practically closed its entire length as it forms the axis of the station group.

Details of construction appear complex, especially at the 16th street crossing, where a 4-level structure with double-decked drawbridge cannot be avoided. The radius of loop curves is very short; and the entire structure would resemble a high wall—between the business district and the west side which, although attractive from an architectural viewpoint, should be avoided.

Illinois Central R. R. Plan—Fig. 30 [Shown in conjunction with the Union Station Plan]: A new Union Terminal is proposed south of 12th street and east of Michigan avenue, for all the roads entering south and east of the river, thus avoiding river crossings. The plan ultimately involves two levels of stub station tracks, inbound trains to use the lower deck at approximately the present street level and outbound trains, the upper level. A new elevated structure running east and west south of 18th street connects the Western Indiana, Pennsylvania and Rock Island rights of way with this terminal. Ample coach yards are available on the recently enlarged right of way south of 18th street. Suburban trains

run beneath the station at sub-level and thence up to Randolph street as at present.

The North Western road would use its present terminal. The St. Paul, the Pan Handle, the Burlington and the roads now using the Grand Central Terminal would be left in their present locations, or in any location that should be decided upon. Thus, quite a radical regrouping of roads is contemplated in respect to terminal facilities, although few changes need be made in the existing rights of way beyond the business district.

The proposition to use one floor for inbound and one for outbound trains would much reduce the ultimate capacity of the station. This, however, is not essential to the station plan and could be modified. This general scheme constitutes a very logical element of a desirable terminal plan for the roads proposed, and it has been incorporated in some of the plans submitted for consideration in this report.

Guenzel and Drummond Plan—Fig. 33: This plan is similar to the Commercial Club and Pond plans in that it proposes the creation of a broad railroad highway along Canal street. It probably would not be necessary to straighten the river under this plan, although the authors deemed it advisable to do so from Lake street south. This plan proposes a complete re-alignment of railroad entrance routes, bringing the roads from the north in over one route, those from the south over another, and providing two routes from the west, necessitating the giving up of a large amount of present railroad rights of way within the city limits. Through operation is proposed, with coach yards situated beyond the stations. Three levels of tracks in the terminals are contemplated; a suburban level placed below the street; a passenger concourse on the street level; above this concourse, two levels of tracks for through service.

This plan would be carried out in a series of four unit stations, one at Randolph street, one at Jackson boulevard, one

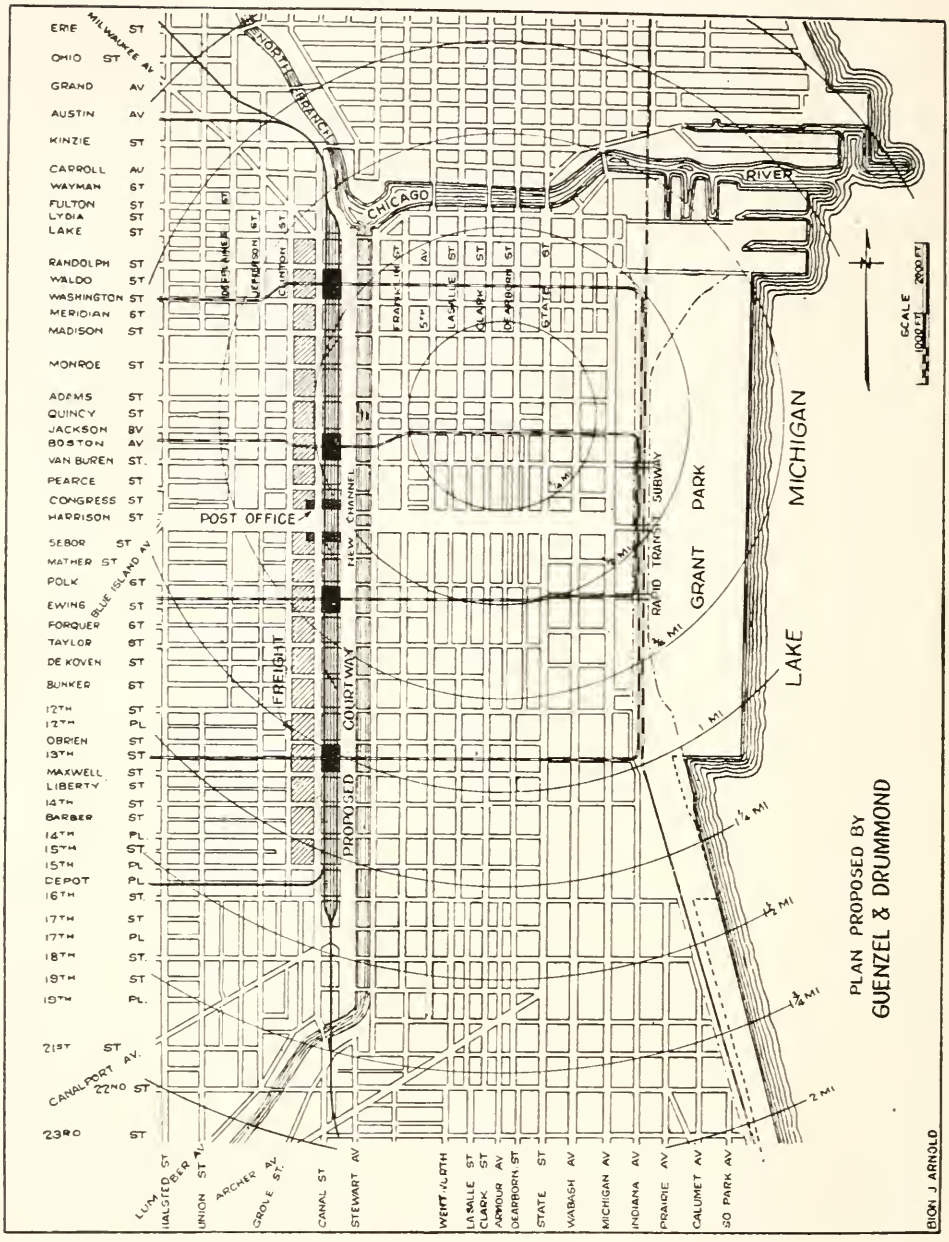

FIGURE 33. PLAN OF GUENZEL & DRUMMOND, ARCHITECTS.

A north and south railroad highway east of Canal Street, consisting of four unit through stations. The plan provides tracks on three levels; suburbans below the street; passenger concourse at street level; outgoing main line trains above the street and in-bound trains on the second elevated level. The river is straightened south of Lake Street. Between the stations and the river is proposed a new street, built over freight tracks. Between Canal and Clinton Streets, warehouses are to be built with basement freight tracks. Intensive development by office buildings and warehouses is proposed over the terminal area.

at Polk street and one at 13th street. Between this line of stations and the river (straightened) a new river-road is proposed. Beneath this road, and on the same level as the suburban tracks, would be placed freight tracks and houses (to which no driveway connections are shown); between Canal and Clinton streets a row of warehouses with freight tracks in the basement, with driveway connections. An underground system of universal freight collection and distribution is proposed between the freight houses and all buildings in the business district, similar in purpose, though not identical in form, with the Chicago freight tunnel system now installed. Similarly, a system of rapid transit subways provides the necessary convenient passenger connection to the stations.

Electrification and complete co-operation between all railroads would be essential to this plan, for it disregards all present facilities in the downtown terminal district. In the effort to secure compactness and adherence to a specific location, costly structures are involved, with the great disadvantage of several decks requiring stairways and elevators, and at the same time erecting a wall to the west which has the same objections as cited in the case of the Pond plan. The number of tracks appear to be too small, but while the expansion of this unit plan would be limited to one direction, it is in a desirable direction—north and south. In working out the very excellent system of development indicated, the authors have evidently considered the needs and development of the city from a very broad viewpoint.

Plan Proposed by Gustave E. Lemmerich: Two loop stations are employed, with 30 station-tracks each, placed below street level, one for western and northern lines, located between 5th avenue, Taylor, Clark and 16th streets, and one for southern and eastern lines located between State, Clark, Polk and 15th streets. The northern and western lines enter on tracks placed east of Canal street crossing the river between

Harrison and Polk streets. The eastern and southern lines enter over the Rock Island right-of-way.

A very comprehensive regrouping of railroad entrances and freight and passenger terminals would here be required. The river would be straightened from Polk street to 17th street. Suburban business would be handled on the outer tracks of the terminal. Union freight houses would be located between Canal street, Polk street, the river (straightened) and 12th street. This plan does not provide sufficient improvement in the street system. The method of handling suburban business would not give the best results, and the track arrangement would be very complex.

Plan Proposed by Carl A. Bessey: No radical change is made in the present location of terminals. It proposes a terminal for the present Union Station interests, very similar to their own proposals but located south of Harrison street instead of at Adams street. The station building would be located on the property bounded by Harrison, Canal, Mather and Clinton streets; the train sheds and station tracks east of Canal street and below the street level. No provision is made for other terminals. A freight station for the Burlington and Pennsylvania is proposed south of Harrison street between Desplaines and Jefferson streets.

This seems to be a very logical location for a station and is the one recommended for the Union Station Company to adopt in case this company is authorized to now build a new terminal, as it would form one of two large terminals to be constructed at present (the other being the Illinois Central at 12th street) and work into the recommended plan.

Plan Proposed by Henry A. Goetz: This plan proposes a single large, double deck Union Passenger Terminal for the main line trains of all roads entering Chicago. This is to be located on 12th street between Clark street and Fifth avenue. It is proposed to operate this terminal as a

"back in" station,—that is, all trains would reverse positions on a connection provided, thus having the passenger coaches the minimum distance from the concourse, which is a decided advantage as in the St. Louis terminal. The lower level of this station would be built now; the upper level when traffic demanded. The suburban business is to be handled on the Illinois Central tracks on the Lake Front, and on the Pennsylvania tracks near Canal street; the roads from the south and west reaching either route via the St. Charles Air line. The river is to be relocated parallel to and 250 feet east of Canal street. Considerable intensive freight development is proposed for the released areas.

While this plan has many desirable features, it is doubtful that a single station for Chicago would be desirable or satisfactory. This plan would not be efficient in the use of ground area as the throat would be very large. It would not adequately open up and otherwise improve the street system south or west between 12th and 16th streets.

Plan Proposed by Josiah Gibson: A group of six passenger stations is proposed fronting on a public square, or quadrangle bounded by Clinton street, Madison street, Canal street and Jackson boulevard. The present North Western terminal fronting on the north side of this quadrangle would form the first station. Facing this main quadrangle between Canal street and the river would also be a terminal express station, a traction terminal and a post office.

The Pan Handle and the St. Paul would use the terminal at Madison and Clinton streets reaching it over a new route from their present rights-of-way. The other two terminals facing Clinton street would be used by the Burlington and the roads now using the Grand Central Station, and would be reached over a new right-of-way north from 16th street; the two terminals facing on Jackson boulevard by the Pennsylvania the La Salle, Dearborn and Illinois Central groups, the latter two of which would cross the river at 16th street

and come north to the terminal on the present Pennsylvania right-of-way along Stewart avenue.

No specific arrangements are suggested for suburban passengers. As no mention is made of freight facilities it is assumed that those are to be left in approximately their present locations.

This plan would concentrate all railroad stations around a center at a point too far north, thus tending further to congest the business district instead of expand it and it is therefore inadvisable. Furthermore, it would involve the requirement on the part of the railway companies of much additional expense in real etsate, which probably would also make it prohibitive.

Plan Proposed by R. C. Sattley: This plan proposes a Union Passenger Terminal for the through passengers of all roads located west of the river between Canal, Polk and Taylor streets; south of this (across Taylor street, widened to 150 feet), a suburban passenger station is proposed for the use of all lines; north of the through station (across Polk street, widened to 150 feet) is proposed an express, baggage and mail terminal for the joint use of all roads. Twelfth street would be widened to 400 feet between Canal street and the river and facing 12th street from the south and extending east for a distance of 1200 feet from Canal street a large freight terminal for the use of all lines and containing 11 similar units is proposed.

The passenger tracks would be beneath the viaduct level. The freight tracks are to be at about the present level of the river bridges and would have driveways on that level for outbound freight and on a level above for inbound freight. Six or more stories for freight storage or warehouse purposes are proposed above these freight tracks and three stories below for freight storage and handling.

The passenger terminal would be divided into 15 units, each unit having two tracks with an island platform reached by

stairways from the concourse above. Each unit would be assigned for the independent use of one or more roads. Office buildings are proposed above the passenger terminals. The express, baggage and mail facilities, as stated above, would be north of the passenger terminal proper and would have several floors both above and below the track level for the handling and storing of baggage and express. This plan lacks flexibility, would probably require a very complex track arrangement and it is doubtful if it could accommodate even the present business.

Plan Proposed by George E. Sanford: This plan proposes a new channel for the south branch of the Chicago river extending from the river to the lake between 23rd and 24th streets. The present channel from Lake street to 23rd street is to be used as a subway with a driveway and parkway above. A channel or tunnel is to be built from about Addison street to a point on the Desplaines river west of Craigin, in order to provide an outlet for the north branch of the river. The passenger terminals are to be placed west of this "released river bed." The freight terminals are to be placed in a group from 16th street to 23rd street and extending about a mile westward from Lake Michigan.

This plan being proposed only in a general way, a careful analysis is impossible, but as it would involve so many radical changes in not only the railroad situation but also in the entire Sanitary District system and the elimination of many riparian rights it is not considered practicable.

SECTION 9.

UNION STATION COMPANY AND PENNSYLVANIA ORDINANCES.

In order to reach a correct conclusion as to just what the Pennsylvania ordinances now pending before the Council provide for, the following analysis has seemed necessary, particularly on account of the important bearing which some of the provisions of these ordinances have on future development of streets, viaducts and tunnels of which the Pennsylvania Company and associates would presumably have no knowledge.

The following is a categorical analysis of the ordinance terms:

Ordinance of the Union Station Company.

What the Ordinance Does:

1 Closes 4,900 lineal feet of existing streets and 400 feet of existing alleys without compensation therefor.

2 Allows the company to occupy sub-sidewalk space, 6,500 feet in length.

3 Allows the company to occupy Canal street full width for 2,300 feet, or five blocks from Madison street to Carroll street, in addition to one full block of sub-surface rights under Canal street, between Adams street and Jackson boulevard.

4 Prevents the construction of four-track high level subways in Adams street or Jackson boulevard to the west (likewise Canal street or Clinton street) by permitting sub-sidewalk occupancy.

5 Permits the Company to pre-empt public space beneath Van Buren, Harrison, Polk, Taylor and 12th street viaducts, also, beneath Madison street viaduct, aggregating 3,800 lineal feet.

Note.—It should be noted that the above analysis refers only to the exact wording of the proposed ordinance. It is understood that an agreement has been reached with the City Engineer's office by which the ordinance, when re-drafted, will rectify a number of the undesirable street elevations. An agreement with the City Bridge Department also covers the construction of a number of bridges, but no provision appears to have been made for a new Monroe Street bridge, which was not considered. Most of the street vacations desired cover streets now partly or wholly occupied for railroad purposes.

6 Permits a hump of 30.8 feet above city datum in Canal street over the proposed station concourse with a minimum sidewalk elevation of plus 16 feet along the proposed property frontage. Makes impracticable the double decking of Canal street.

7 Introduces a hump of 29 feet above city datum in Harrison street over railroad tracks as compared with 22 feet at the river bridge, and 21 feet at Canal street.

8 Allows company to extend viaducts to Canal street but the abutting grade of Canal street south of Harrison street is indefinite.

9 Gives the company right to develop terminal structures east of Canal street from Carroll to Madison on property now owned by private interests provided it can make arrangements with present owners for its occupancy.

10 Permits company to raise bridge approaches over its tracks considerably higher than the river bridges.

11 Introduces new river obstructions and possible legal complications with the Sanitary District by binding the city not to permit any new construction west of the established dock line of the Chicago River channel between West Randolph and West Van Buren streets, thus practically preventing the construction of the new proposed Monroe street bridge.

12 Authorizes company to construct, without reservation, subways connecting its station with subway lines to be built, with no power vested in the City for the reservation of streets or sub-surface rights which may be necessary for future subways.

13 Gives the company right to elevate the east sidewalk of Canal street to suit its purposes without regard to the grade of Canal street.

14 Changes all crossings of Canal street with east—west streets on level to grades up to 2½ per cent. except at Harrison and 12th streets.

What the Ordinance Does Not Do:

1 Opens no new streets.

2 Widens no streets (except 12th street along the Pennsylvania Company's freight property).

3 Leaves Canal street with more humps than ever and prevents carrying out of a reasonable plan of double decking this street.

4 Ordinance does not provide for the equalization of approach grades on viaducts crossing the river and the company's property to a uniform grade on Canal street.

5 Makes no provision for the construction of a viaduct across the company's property at Monroe street to connect with the future Monroe street bridge.

6 Marginal way along the river bank absolutely prohibited, also, the development of rail-to-water transfer facilities.

7 Boundaries of district covered by contemplated improvement not clearly defined.

8 Does not state clearly who pays for regrading of streets and approaches other than those on or over the company's property.

9 Apparently does not make necessary the regrading of Canal street simultaneously with the railroad improvement, thus making possible wide difference in elevations between the east sidewalk and the street.

PENNSYLVANIA FREIGHT TERMINAL ORDINANCE.

1 Depresses Canal street and adjacent streets to an elevation of about two feet above city datum at 16th street, whereas the present level of the street is about 13 feet and that of the viaduct bridge 26 feet above datum.

2 Permits earthen fill or other retaining method along the elevated right of way.

3 Permits a structure elevated to 43 feet above datum over 18th street and 53 feet above datum at the crossing of 16th street and Soo Line tracks.

4 Appears to be inconsistent in the statement of elevation of tracks of the upper warehouse level.

5 Closes 1,100 feet of existing streets and 1,200 feet of alleys without compensation therefor.

The following list includes all privileges requested as to vacating public streets and areas:

Street	From	To	Approx. Length
West Water Street	Washington Street	W. Madison	400 ft.
Sebor Street	Stewart Avenue	Ellsworth Street	300 ft.
Ellsworth Street	Harrison Street	A point 243 ft. north of North line of Polk	700 ft.
Stewart Avenue	Van Buren Street	12th Street	3500 ft.
Law Avenue	Harrison Street	To a point 416 ft. north of Harrison Street	1100 ft.
Law Avenue	Harrison Street	Polk Street	
All public alleys bounded by West Van Buren Street, South Jefferson Street and South Desplaines Street			400 ft.
All public alleys bounded by West Harrison Street, West Polk Street, South Jefferson Street and Law Avenue			800 ft.
All public alleys bounded by West Van Buren, West Harrison, Stewart Avenue, and S. Canal Street			400 ft.

Summarizing the above analysis, the most important points for further consideration are—the unlimited use of Canal street, the absence of any grade equalization of streets and viaducts, the lack of provision for a river road, or for double-decking Canal street, the prevention of a new bridge in Monroe street, the concentration of freight traffic on Harrison street, and the unsightly elevated structure to be erected west of the river. The provision for building subways quite probably was not intended for as broad an interpretation as shown herein, but nevertheless should be understood.

In view of the above questionable points which appear to be involved, these ordinances, if granted, should certainly be revised to cover more definitely the things intended, to restrict some of the privileges granted, possibly to grant other privileges more needed, and to provide for an equitable interchange of values between the city and the companies.

The principal stipulations of these ordinances that have been modified by Mr. Wallace in his recommendations are substantially as follows:

1 Recession of freight house one block to the south—from Van Buren to Harrison street.

2 Depression of freight entrance leads thereto (covered subways not stipulated).

3 Double decking of Canal street (limits not defined).

4 Utilization of block between Harrison and Van Buren streets for railroad purposes, provided no tracks are above ground.

No change in the Union Station ordinance is stipulated.

SECTION 10.

POSSIBLE REGROUPING OF RAILROAD FACILITIES.

The following studies primarily consider the railroad problem of Chicago as a whole, and by means of an analysis of the different classes of traffic and the existing physical relations between roads, methods of improvement are suggested by alternative plans, some of which are possible to put into immediate operation, assuming reasonable unity of action among the roads interested.

Consolidation of Terminal Properties: In determining whether one or more stations for through trains will most effectively handle Chicago traffic the following considerations appear necessary:

1 The selection of a site adequate from a railroad standpoint but not too far from the central business district as it may be ten years hence.

2 A site provided with adequate entrance and exit thoroughfares and reasonably convenient to rapid transit facilities.

3 The consolidation of terminal operations to a point beyond which a decrease rather than increase in efficiency may result. As for example the matter of train interference at entrance throats.

4 Relative costs of the projects.

5 Degree of co-operation possible between competing roads.

Segregation of Terminals: Suburban passenger service may be characterized by short hauls, frequent stops, high rates of acceleration and braking, quick loading and unloading and convenient access to various points of originating traffic. On the other hand, long distance service has practically the opposite characteristics. In addition long distance trains require much longer standing time in the station for loading passengers and handling baggage. Ordinarily, changing the locomotive from one end of the train to the other is all that is needed in suburban service operated by steam locomotives, while several movements are necessary to place mail, express and parlor cars on through trains as usually operated.

Suburban traffic, furthermore, is carried at very low rates of fare compared with through traffic, due to the immensely greater volume and stability of this class of travel and in many cases the necessity for competing with cheaper methods of transportation. In return, the commuter willingly accepts less elaborate facilities and equipment, demanding only convenience, frequency and low fares.

It is thus clear that an entirely distinct treatment is called for in the handling of Chicago suburban traffic, which amounts to about 42,000,000 passengers per year, one-third of which is along the lake front. This traffic does not demand expensive terminals and elaborate appointments, but instead the quickest possible access to the business district, involving the least walk and the least delay in reaching train platforms.

The terminal studies herein have, therefore, been carried out with the object of locating terminal facilities for suburban and through traffic respectively at the most practicable points and without undue efforts to combine them in a single terminal. Where combined terminals appear logically demanded by these classes of traffic the scheme has been adjusted thereto. But in order to secure most efficient handling, these two classes of traffic are generally kept separate, even in a combined terminal.

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It is entirely possible, in fact probable, that a single Union Terminal for all classes of traffic and for all roads entering Chicago would in time become unwieldy, especially if not electrified, and its final dimensions and capacity ultimately reached no matter where located unless on the lake front with unlimited authority to extend into and along the lake. The separation of the suburban traffic which amounts to 64 per cent. of the total, from the through traffic operates to bring a Union Terminal for through traffic within the range of usefulness, and the focal point of the problem then shifts to practicable passenger entrances into the city, a matter requiring independent determination.

Entrance rights-of-way: There are at present 26 separate railroad lines entering Chicago, entailing within the city limits 135 railway crossings at grade. One passenger line before reaching the down-town terminal crosses other tracks about 18 times at grade, with numerous street crossings and several bridges. Reference to the railroad map shows numerous parallel rights-of-way and circuitous entrances resulting from competitive operation. While it is true that a veritable struggle for existence has furnished the occasion for many of these duplications, it is now believed to be high time for the City of Chicago to exercise its just powers of control over the development of the city and, if necessary, compel the more effective use of all this trackage instead of permitting more to be built. The following studies indicate that by regrouping the passenger and freight entrances it is possible to save a very large amount of mileage and delay now encountered by both passenger and freight traffic, the equivalent of which, in money, compounded through a term of years, would more than pay the cost of the entire terminal change, although it should not be assumed that the saving thus effected would be proportioned to the number of train miles saved.

Re-grouping Studies: General studies are presented herein more with the object of showing possibilities than to attempt

to fix definite lines of future railroad regrouping. This must be left to the railroads themselves to work out in the best possible manner consistent with their respective rights. Four general plans of regrouping have been developed, as follows:

1 Unit Station Plan.
2 Two Station Plan.
3 Three Station Plan.
4 Four Station Plan.

The Unit Station Plan attempts to utilize the general plan proposed originally by Mr. Burnham and later by Messrs. Pond & Pond and Guenzel & Drummond, together with the suburban link, which is a feature of all plans as here developed.

The Two, Three and Four Station plans recognize the permanency of the present North Western Station, at least for long distance traffic. The remaining variants involve Union Stations on the Illinois Central, Hunt and Pennsylvania sites, respectively. It is assumed the terminal business will be divided among these Union Stations.

In general the advantage to be realized from any scheme of regrouping lies almost entirely in the saving in train miles, running time and river and grade crossings; and the potential value of an improved entrance is considered sufficient to possibly warrant the abandonment of some important rights-of-way to exclusively freight service or freight and suburban service, or interchange passenger service with other roads.

Roads Affected: A study of the entrance facilities of the 26 roads reveals many improvements that appear logical, not only from the standpoint of operation but also from that of general railroad policy. It is, of course, impossible here to predetermine operating or financial relationships and there has not been time to study in detail the problems of physical connection throughout this network of lines, but some apparent and important opportunities for improvement are listed below:

Baltimore & Ohio R. R.: Reference to any railroad map

shows this road paralleling the Lake Shore from the east as far as South Chicago. Originally this line used the Illinois Central right-of-way from Brookdale into the latter's Randolph street terminal. Later the B. & O. found an opportunity to purchase the Chicago Terminal Transfer Company and as a result changed its entrance into the city so as to use this round-about line, running through Burnside and Forest Hill and thence north in Western avenue. This occasions a diversion of from seven to eight miles, all of which could be saved by using the Illinois Central entrance. This would also reduce the railway crossings—now 18 (five of which are interlocked crossings)—to 5 (3 of which are interlocked), and would reduce the street crossings at grade by 17, avoid 3 drawbridges, and reduce the average train time between the terminal station and South Chicago from 50 minutes to 33. On the basis of 14 trains per day this saving amounts to 108 train miles and 3 hours and 58 minutes train time per day.

Inasmuch as the B. & O. now leases running rights over the Rock Island, etc., from South Chicago to Forest Hill (a distance of about eight miles) it is difficult to see the advantage of the circuitous route if proper station facilities were made available at the I. C. lake front station.

Chicago & Grand Trunk Ry. System: This line crosses the C. & E. I. at Thornton Junction just below the Little Calumet river and detours through Blue Island and Glendale, thence east to the C. & W. Ind. main line at 47th street, thence northerly to the Dearborn Station. This diversion amounts to approximately 4½ miles in excess of the mileage necessary over the C. & W. Ind. main line or the Illinois Central main line north from Harvey. The use of the C. & W. I. main line would also reduce the number of railroad crossings and eliminate a large number of street grade crossings.

The C. & G. T. Railway is one-fifth owner of the C. & W. Ind., consequently the only rental would be about three miles of C. & E. I. line from Thornton Junction to Dolton, the

balance on affiliated right-of-way. They now run 13 trains a day and under the suggested route they would save 52 train miles daily.

Pan Handle: This Penna. Line intersects the C. & W. Ind. at Dolton and the I. C. a little further north at Riverdale. Its present line diverts as far as Western avenue, thence running north to Kinzie street and then east and south to reach the Union Station, a total divergence of approximately 5 miles over that required to reach the Dearborn or Illinois Central Stations. This revised route would reduce railroad grade crossings by more than half; 100 train miles would be saved daily on its 20 trains.

Illinois Central Western Division: The Western branch of the Ill. Cent. system enters the city below Hawthorne and skirts the South Branch of the Chicago river to 16th street, thence over the Air Line connection to the 12th street station. Should this line stay to the west of the river it could find an exceedingly convenient entrance to the West Side Union Station via the Burlington tracks from La Vergne, thereby saving nearly a mile, a large number of grade crossings, and about 10 minutes running time. Evidently the separation of a part of the business of the road from its main station on 12th street would militate against this plan, especially with a reconstructed Air Line.

Soo Line: This line which is the Chicago entrance of the Canadian Pacific Ry. and which has recently constructed important and expensive freight terminals on Canal street south of 12th street, detours over seven miles south of the St. Paul connection at Franklin Park in order to reach the I. C. station at 12th street. Should this line use the St. Paul tracks into the West Side station, saving in distance would amount to no less than five miles and in running time to from twelve to fifteen minutes, also saving one river crossing and four railroad grade crossings.

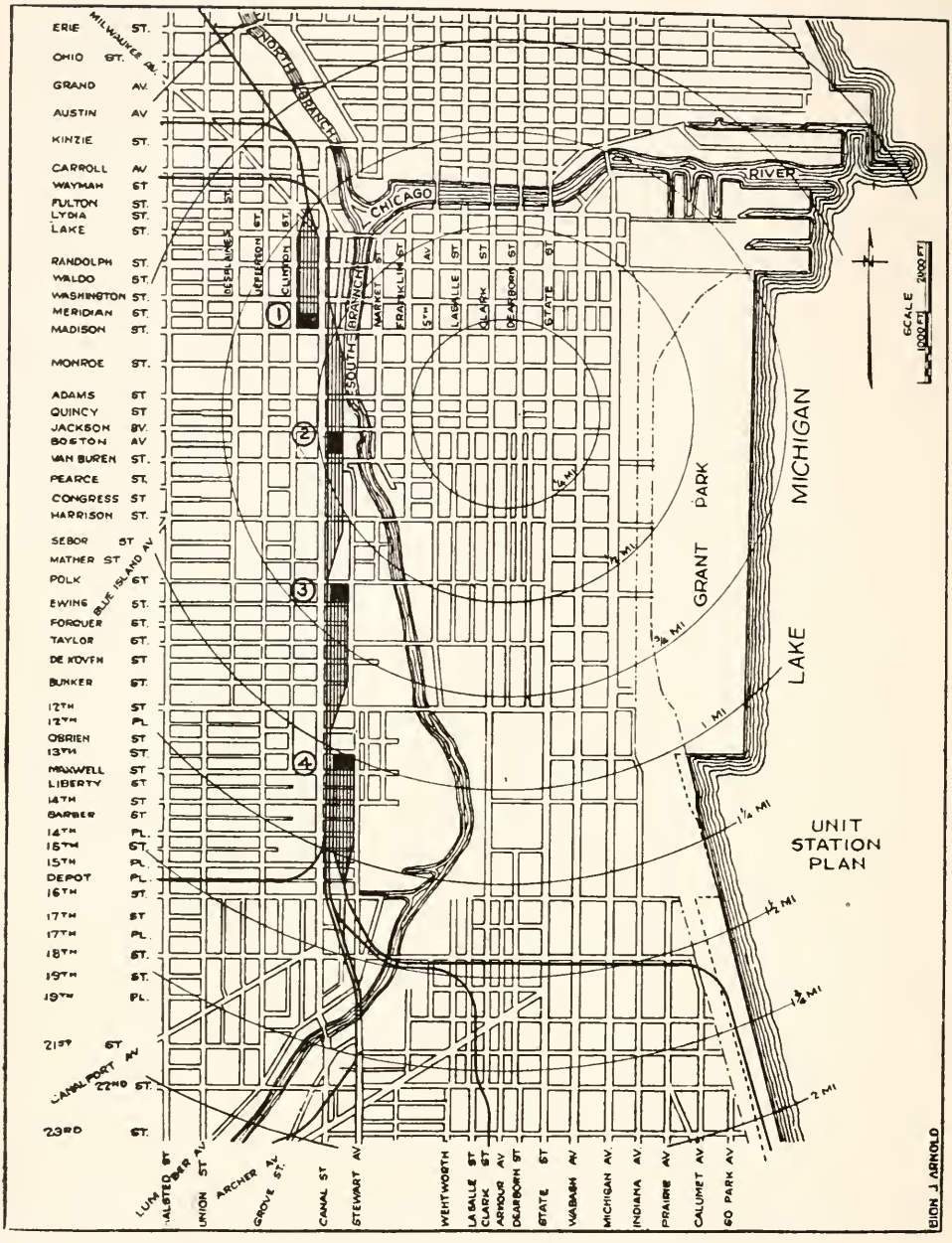

FIGURE 34. UNIT STATION PLAN.

This plan proposes a series of four stations along Canal Street, of which the present Chicago & North Western Station forms the first. The other three would be east of Canal Street—one at Van Buren, one at Polk and one at Maxwell Street. The roads entering over the Illinois Central and Chicago, Rock Island & Pacific rights-of-way would connect with these stations over a new route south of 18th Street. This removes practically all railroad barriers to the expansion of the business district southward, but causes many additional railroad river crossings, unless a tunnel under the river is used.

This plat shows existing streets and river as at present. With the river straightened, much latitude exists for street opening and rearrangement.

Wabash Eastern Division: Parallels the B. & O. entering Chicago as far as Clark Junction (south of Indiana Harbor). Its logical entrance is via the B. & O. and I. C. to the 12th

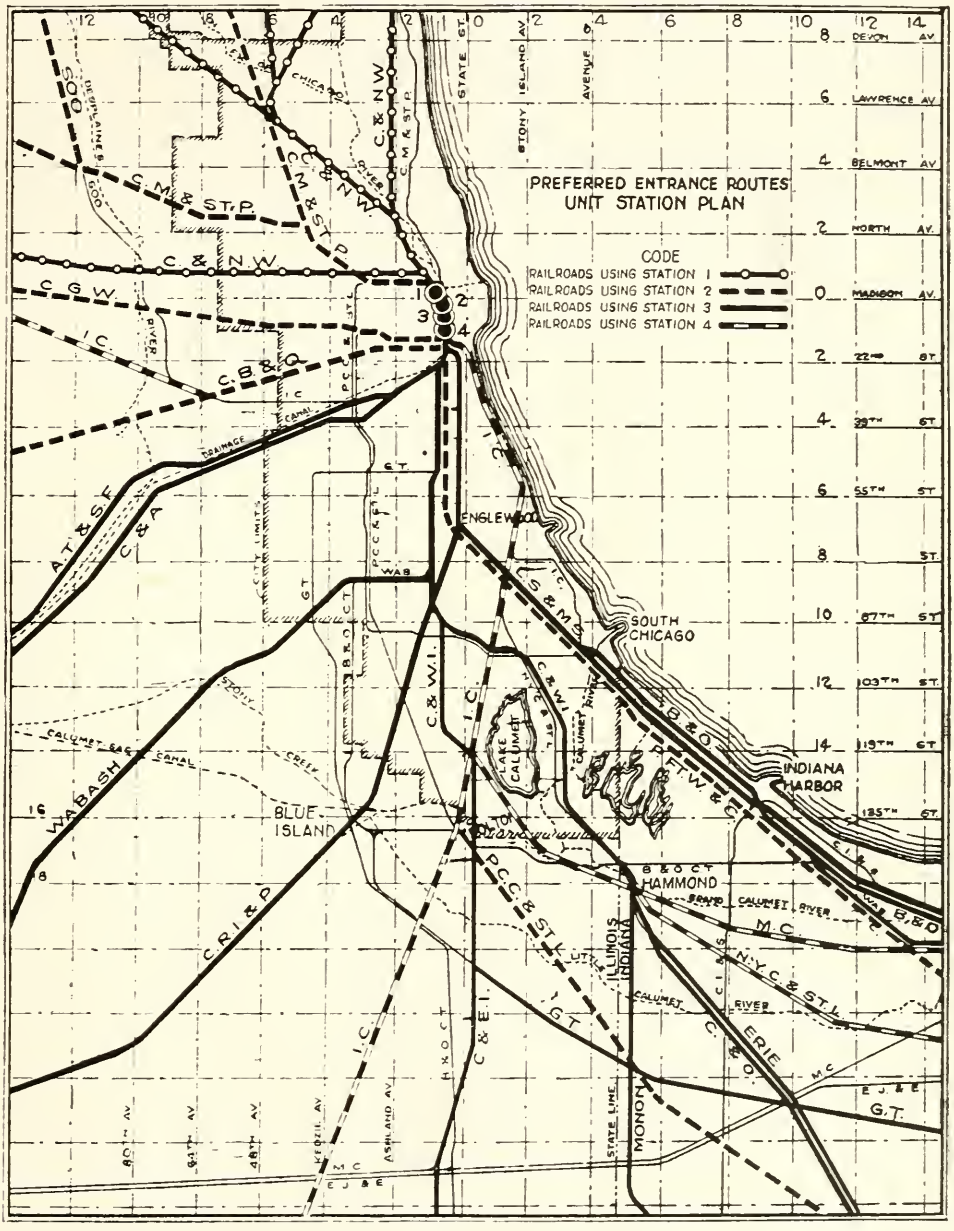

FIGURE 35. RAILROAD ENTRANCE ROUTES—UNIT STATION PLAN.

This contemplates some rearrangement of railroad entrances to the city, saving many railroad and river crossings and, in some cases, considerable mileage, and greatly simplifies the present network of tracks. Those rights-of-way which are relieved of main line traffic (shown in light lines) can be used for suburban rapid transit or freight development.

street station. It now detours west of Clark Junction to reach the C. & W. Ind., thence to Dearborn Station; a net loss of $4\frac{1}{2}$ miles. On the basis of 19 through trains it would save

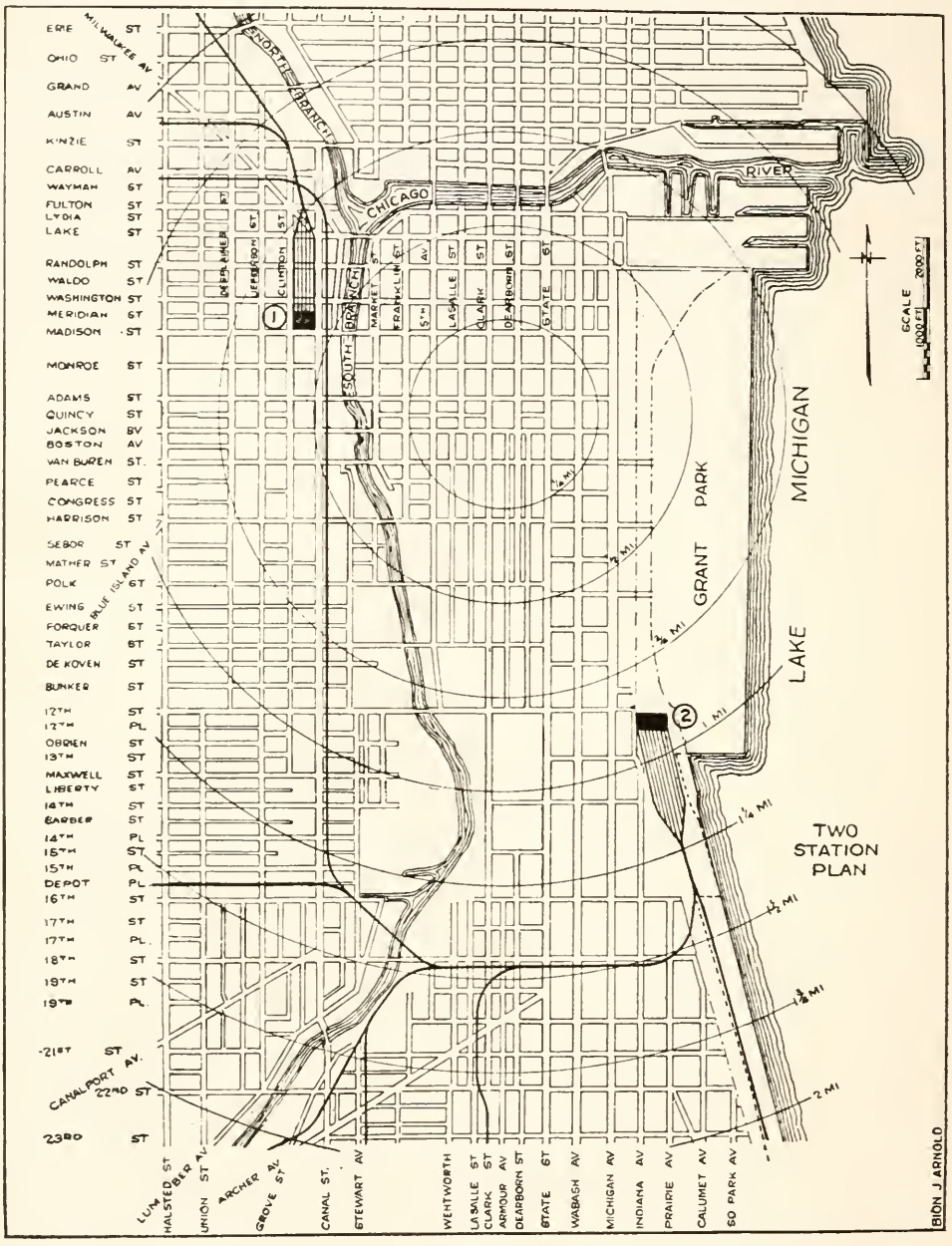

FIGURE 36. TWO-STATION PLAN.

This proposes two passenger terminals, the present Chicago & North Western Station for the Chicago & North Western, and a new terminal on the Illinois Central property south of 12th Street on the lake front for all other roads. This removes practically all railroad barriers to the expansion of the business district and provides a logical terminal for all lines entering from the south, but occasions a considerable detour and river crossings for roads from the west and north.

Streets and river shown as now existing.

85 train miles daily and would avoid several railroad crossings.

Pere Marquette: Follows an excellent entrance route as

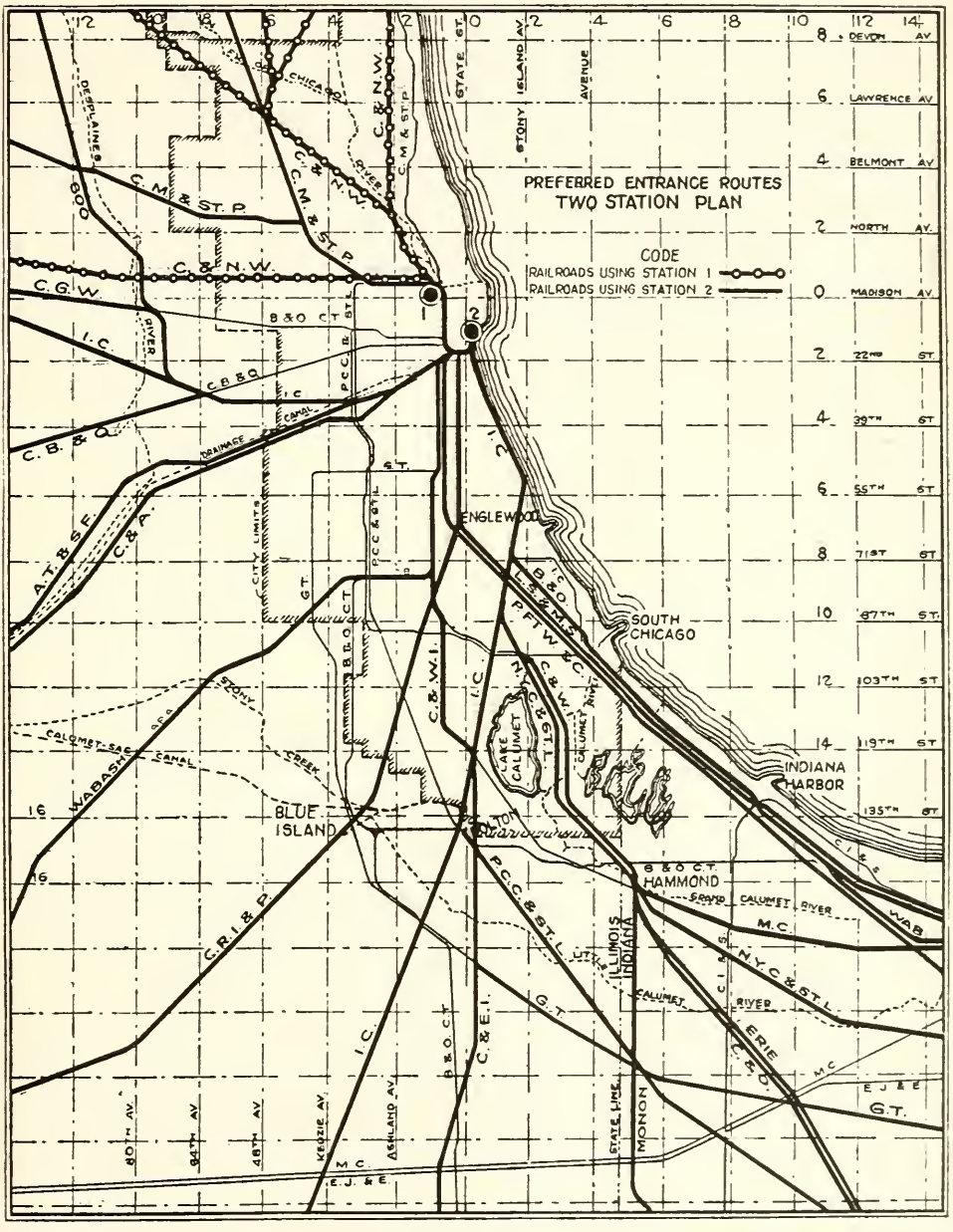

FIGURE 37. RAILROAD ENTRANCE ROUTES—TWO-STATION PLAN.

This plan contemplates some rearrangement of railroad entrances to the city, saving many railroad and river crossings and considerable train mileage, and simplifies the present network of tracks entering the city. Those rights-of-way which are relieved of main line traffic (shown in light lines) can be used for suburban rapid transit or freight development.

far as the Chicago river, thence it diverts to the Grand Central Station. This eastern line should evidently remain in an East Side station and avoid two river crossings.

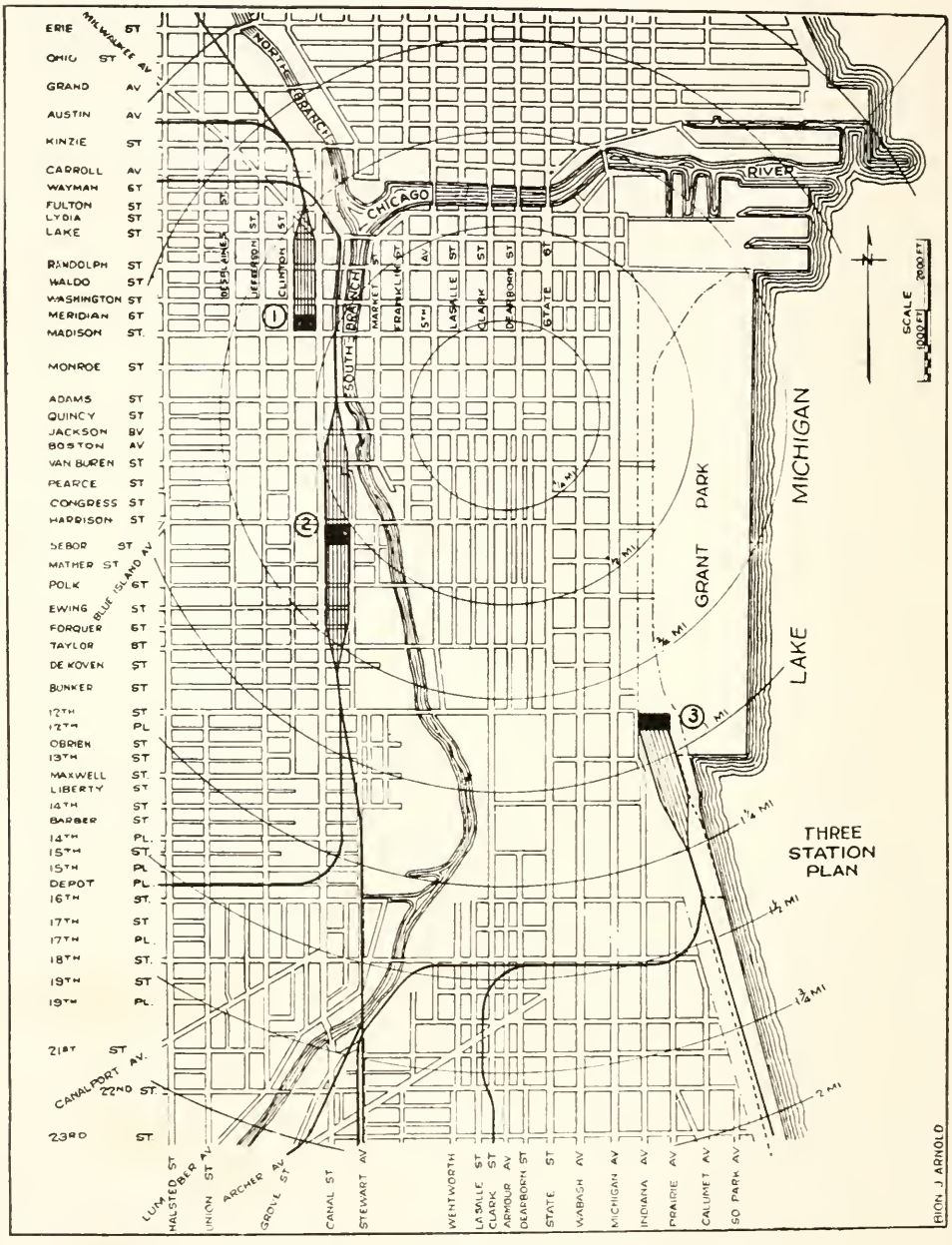

FIGURE 38. THREE-STATION PLAN.

This plan contemplates three terminals, the first being the present Chicago & North Western Station, the second being located at Harrison Street, between Canal Street and the river, and the third being located at 12th Street and the lake front. This plan permits great expansion of the business district. With proper grouping of the railroads many of the railroad and river crossings would be eliminated, and the street system would be greatly improved.

Streets and river shown as now existing.

Santa Fe: Passenger entrance, unfortunately, crosses the Drainage Canal and the South Fork of the South Branch of the Chicago river to the south side in order to reach the Dearborn Station.

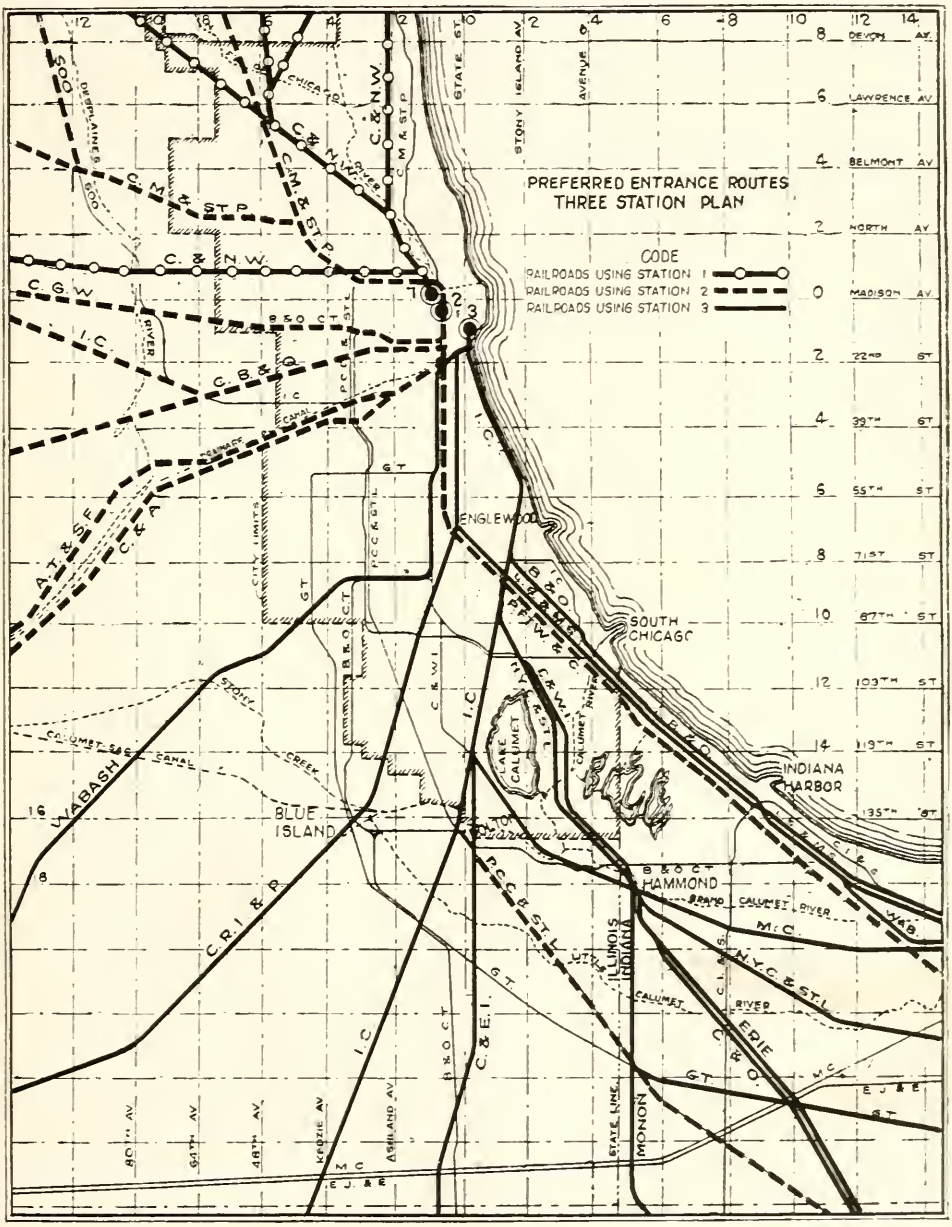

FIGURE 39. RAILROAD ENTRANCE ROUTES—THREE-STATION PLAN.

This plan contemplates some rearrangement of railroad entrances to the city, saving many railroad and river crossings and considerable train mileage, and simplifies the present network of tracks entering the city. Those rights-of-way relieved of main line traffic (shown in light lines) can be used for suburban rapid transit or freight development.

Alton: On the other hand, the Alton, with the P. Ft. W. & C., crosses the Chicago river in order to reach the Union Station.

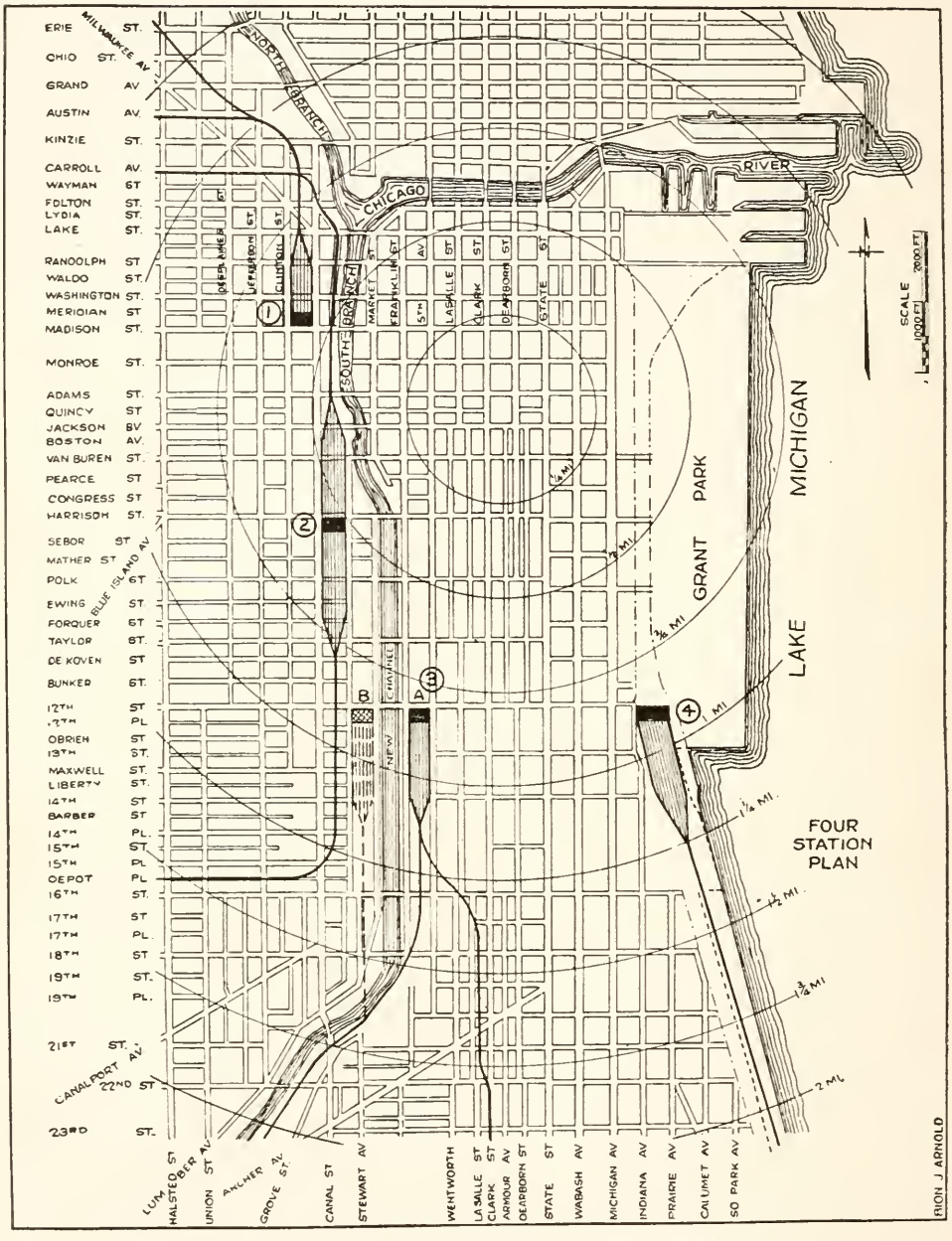

FIGURE 40. FOUR-STATION PLAN.

This plan contemplates four terminals, the present Chicago & North Western Station being the first, the second at Harrison and Canal Streets for roads entering from the west, the third at La Salle and 12th Streets, and the fourth at 12th Street and the lake front. These last two terminals are for roads entering from the south, southwest and southeast. The throat of the business district at 12th Street is here doubled in width, and considerable improvement of the street system is possible.

Here, the river is shown straightened as in Plate II and streets extended.

St. Paul (Evanston Division): This line, crossing the North Branch of the Chicago river at Kinzie street, has not been considered as a passenger route, because it has been practically given over to freight service.

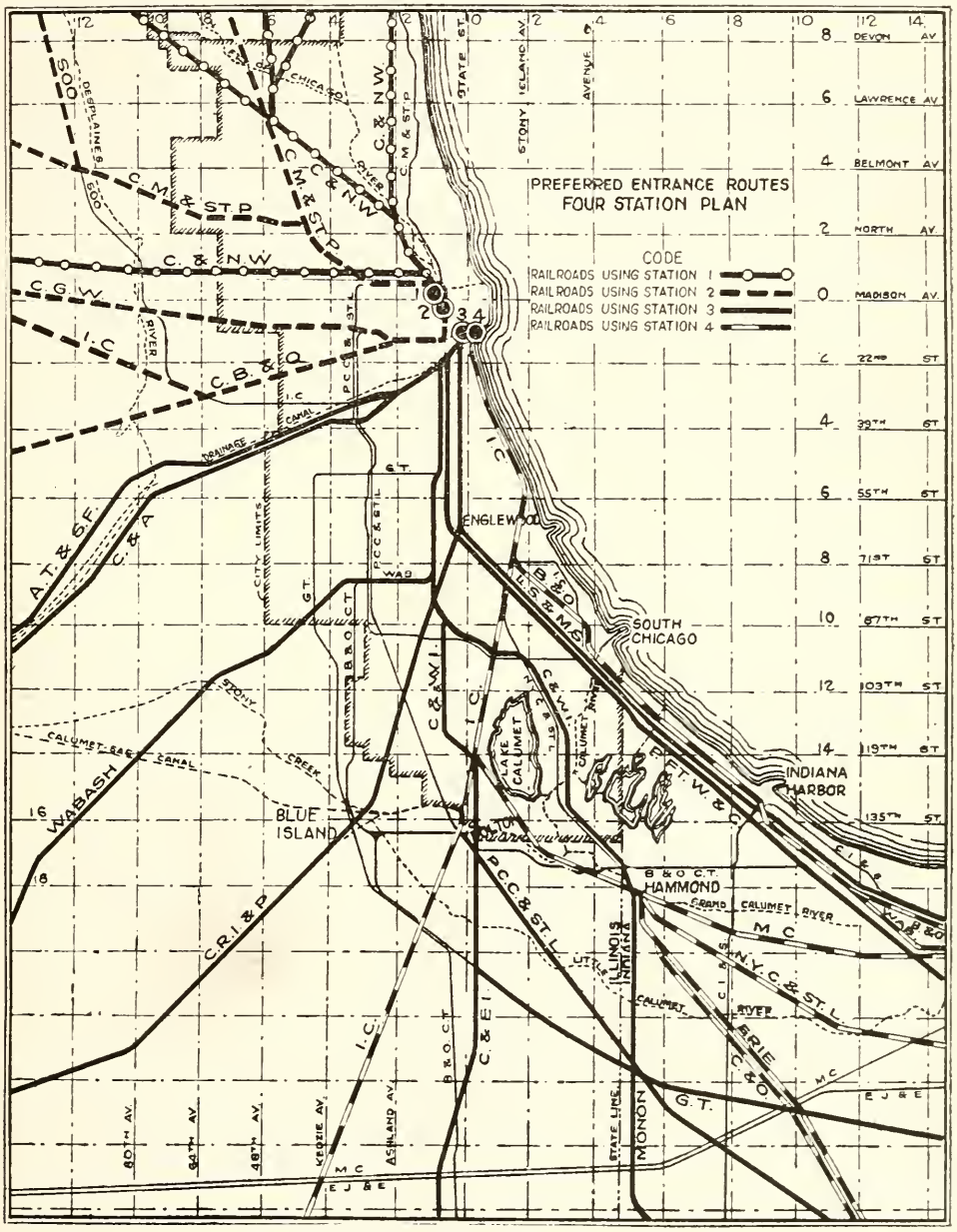

FIGURE 41. RAILROAD ENTRANCE ROUTES—FOUR-STATION PLAN.

This plan contemplates some rearrangement of railroad entrances to the city, saving many railroad and river crossings and considerable train mileage, and simplifies the present network of tracks entering the city. Those rights-of-way relieved of main line traffic (shown in light lines) can be used for suburban rapid transit or freight development.

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Results of Re-grouping: I. Unit Station Plan, Figs. 34-35. This contemplates a "railroad highway" west of the river. Here, the latitude in regrouping is so wide as to make it difficult to predetermine results in concrete form, but the general changes indicated above largely apply.

II. Two Station Plan, Figs. 36-37: All roads except the North Western would use the Illinois Central Terminal. Obviously this plan is too rigid and forces unnecessary river crossings and detours. If the suburban link north and west under the river could be used as a main line entrance for the St. Paul and the Soo Line, some of this difficulty could be avoided, and further, if the North Western Station could be enlarged to accommodate all the northern lines and some western lines, leaving the I. C. for the southern and eastern lines, a much better distribution of service would result.

III. Three Station Plan, Figs. 38-39: This plan recognizes the necessity of a Union West Side station for the accommodation of western roads so as to avoid river crossings to the greatest possible extent. The Illinois Central and the North Western stations would constitute two of these and the third could be located on 12th street between Canal street and the river, or at any point between 12th street and the Chicago & North Western Station. Figure 38 shows this station located with its headhouse south of Harrison street, thus bringing it on one of the streets that has been proposed as a civic axis by the Chicago Plan Commission.

IV. Four Station Plan, Figs. 40-41: This represents the maximum possible concessions that should be made at present to individual railroad interests. It suggests three Union Stations in addition to the North Western Station. It also gives the maximum freedom from river crossings and makes it possible to add additional stations in the future to the southward along Canal street or south of and abutting on 12th street, as future conditions may require.

This Four Station Plan assumes the river straightened south of Harrison street as in Plate IIA, leaving three station sites available, one west of the river and one or two between the river and LaSalle street (extended from the north), and it ought not to receive serious consideration unless the river could be straightened at least from 12th street southward, thus enabling a central Union Terminal or a group of terminals to occupy the entire space south of 12th street, from the river, straightened, to La Salle street or possibly Clark street. But as the object of all these improvements is to open the business district, the least possible space should be given over to terminals, even with the throat to the south widened. If La Salle street, extended through from the north, could be made the eastern boundary of the terminal area, such a plan would be much more favorable to the city's interests than any four-station plan based upon the present river location.

Ultimate Four Station Plan, Fig. 42: This can better be accomplished with the river straightened south of Van Buren street along Stewart avenue, as developed elsewhere in this report. (Plate III.) Diagrammatically the accompanying sketch, Fig. 42, indicates the advantages of this plan. It is based upon the assumption that the Union Station interests might develop the Harrison or Adams street site for the western and northwestern roads, including the St. Paul and the Soo Line from the north, and the Burlington and Great Western from the west. While the Pennsylvania line might also occupy this station temporarily, it would soon be forced to another location, through the growth of traffic in this station.

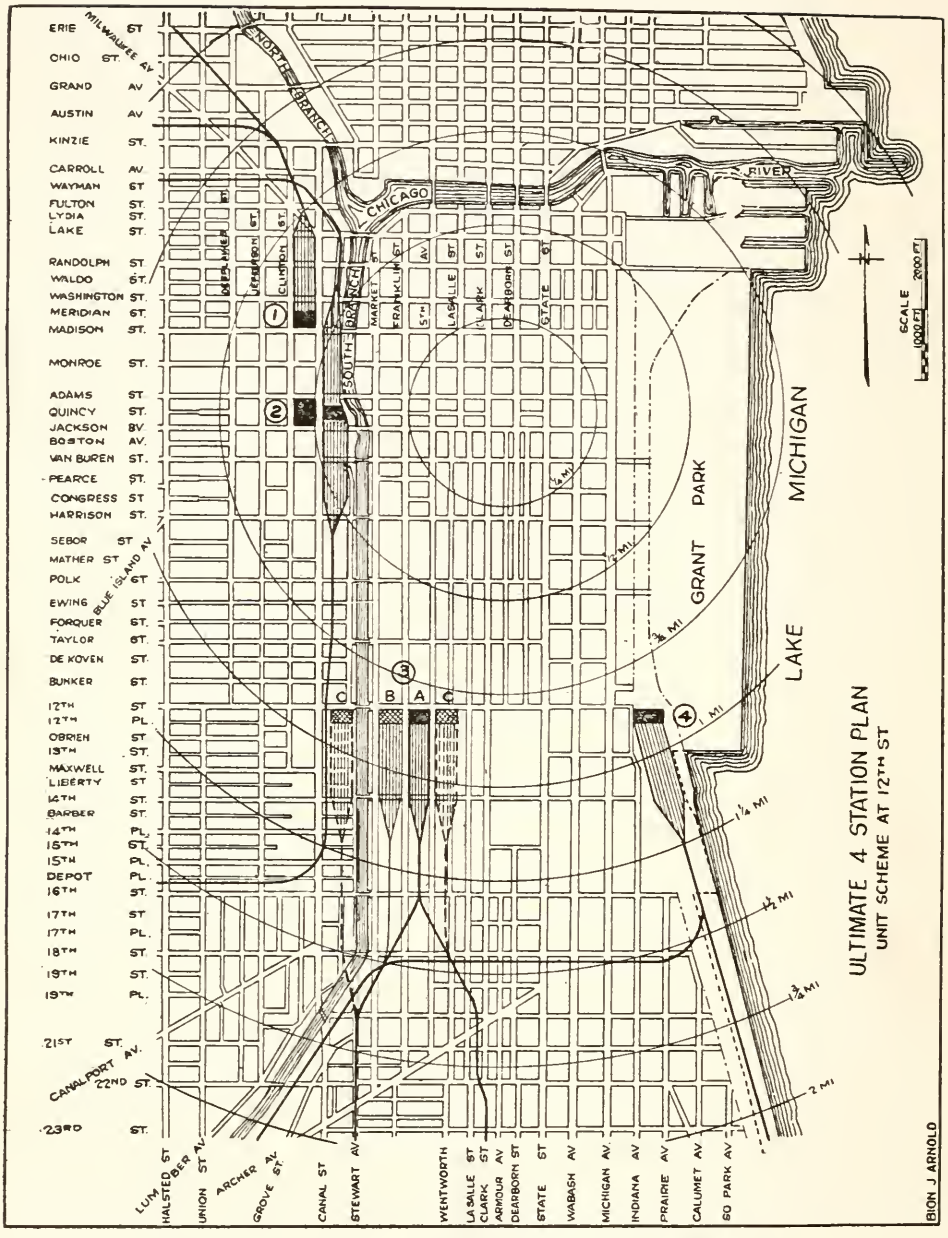

FIGURE 42. ULTIMATE FOUR-STATION PLAN.

This figure shows the maximum number of passenger terminal stations which should be permitted in Chicago. One station is to be located at Madison and Canal Streets for the North Western, one at Adams and Canal Streets for the other northern and western roads, one at 12th and Franklin Streets for the southern and southwestern roads, and one at 12th Street and the lake front for southern and eastern roads. The river is to be straightened from Van Buren Street south. The number of through east and west streets would be greatly increased and the number of north and south streets out of the business district would be more than doubled. The station sites A, B, C, etc., would be filled, preferably, in the order named.

Should the four-station plan be decided upon it would appear wise to limit the use of the second West Side station, C. & N. W. being the first, to those lines which properly belong west of the river, viz.: C. M. & St. P., the Soo, C. B. & Q., C. G. W. and possibly the Western Division of the Illinois Central. In this event, the property between Canal street and the river (straightened due south from Van Buren street) would be occupied between Madison street and Harrison street by a station of the size now proposed by the Union Station Company at Adams street. Such a station would probably be sufficient for these West Side roads for perhaps 35 to 40 years to come, not including the Pennsylvania.

East of the straightened river, between the river and La Salle street, there is room for two or three adjacent stations, on the unit plan, which could accommodate all of the southern roads that had failed to find a more suitable terminus in the Illinois Central station on the Lake Front. This plan would exactly double the present width of the throat of the business district at 12th street. It would provide new and extended streets in the terminal district. It would enable all track elevations to the south to be used to advantage. It would entirely avoid river crossings by eastern and southern roads except for freight, and it would give each system its logical entrance without undue advantage to any particular road. Eventually the connections between stations would be provided by rapid transit lines which would go far to remove any inconvenience to patrons resulting from locations further from the business center than are the present terminals.

The station or stations should be built abutting on 12th street and between Market and La Salle streets (extended) in 1, 2 or 3 units of 16 tracks each, as needed, with streets between. Each unit of 16 tracks should properly care for about 35 through trains per hour during the rush period, or, as trains are now timed, about 315 trains per day. The most westerly station should be used by the Alton, Santa Fe, Ft.

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Wayne, Pan Handle and C. & W. Indiana group. These lines have 20 through and 9 suburban trains in the rush hour, and 178 through and 65 suburban trains each 24 hours. One unit would, therefore, appear to be sufficient to handle all through service for some time to come, if the suburbans could be handled elsewhere.

It would seem best to construct two units, or one large station having the capacity of two units, at once, and be ready to offer facilities to the present La Salle Station group whenever they find themselves cramped for room or for any other reason need a new site. Or, better, if it could be brought about, the suburban service of all of these roads could be handled underground, in the present La Salle Street Station, and all through traffic now handled at the La Salle Street Station could drop back and occupy the easterly unit proposed. (Unit A, Fig. 42.)

Again, should the New York Central roads, *i. e.,* the Lake Shore, Nickel Plate and C. I. & S., elect to join in using the Illinois Central Station, with the two lines of that company now there, viz.: Michigan Central and Big Four, then the Rock Island through trains could probably be cared for together with all through trains of the Western Indiana group suggested above, in one 16 track unit; thus leaving two additional units to be built when Chicago's needs outgrow the facilities first provided.

This idea contemplates a Central Union Terminal on the unit principle, as already advocated by Messrs. Delano, Pond, Drummond and others, each in somewhat different form and location. The stub type of station for this particular location is used because of its peculiar adaptability to the location. There is, however, nothing to prevent the adoption, at this location, of a single large station of the Jarvis Hunt type, or one of the type proposed by the officers and engineers of the Chicago Plan Commission, or some other type, which ever the future shall prove desirable.

Railroad Suburban Through Route (Figure 44): As briefly mentioned under discussion of rapid transit, an ideal suburban system would be one in which some scheme of through routing could be worked out for enabling passengers from each suburb to reach opposite parts of the city without change of cars. But an analysis of existing and probable suburban traffic shows this ideal condition to be possible for only a small part of the traffic. By reference to the chart of suburban train movement (Figure 43), it will be seen that the volume of traffic inbound and outbound is greatly unbalanced. If all these trains be considered as coming into a single Union Station, it appears that the balanced traffic represents only 15 trains per hour on all lines, whereas during the rush hours 80 trains per hour are required, a ratio of over five to one.

In the through routing plan this unbalanced traffic would naturally stop at the business district precisely as in street car operation, the extra or unbalanced service during rush hours being brought only to the business district and thence to coach yards. A further difference exists which renders the steam suburban business more unbalanced than that of surface transit lines owing to the length of haul, *i. e.*, suburban trains are only able to make one trip during the rush period, whereas on city transit lines, cars may make two trips or more during the same period.

Referring now to Plate VI showing the distribution of suburban car movement on the various roads, the difficulty of developing a complete through routing plan, will appear for the following reasons:

1 The disparity of suburban traffic on various roads which logically should be connected into a through route system.

2 The great disparty between inbound traffic on the one hand and outbound traffic on the other in the case of those roads which should logically be connected; some of the roads having no suburban service at all during the maximum, or rush hour.

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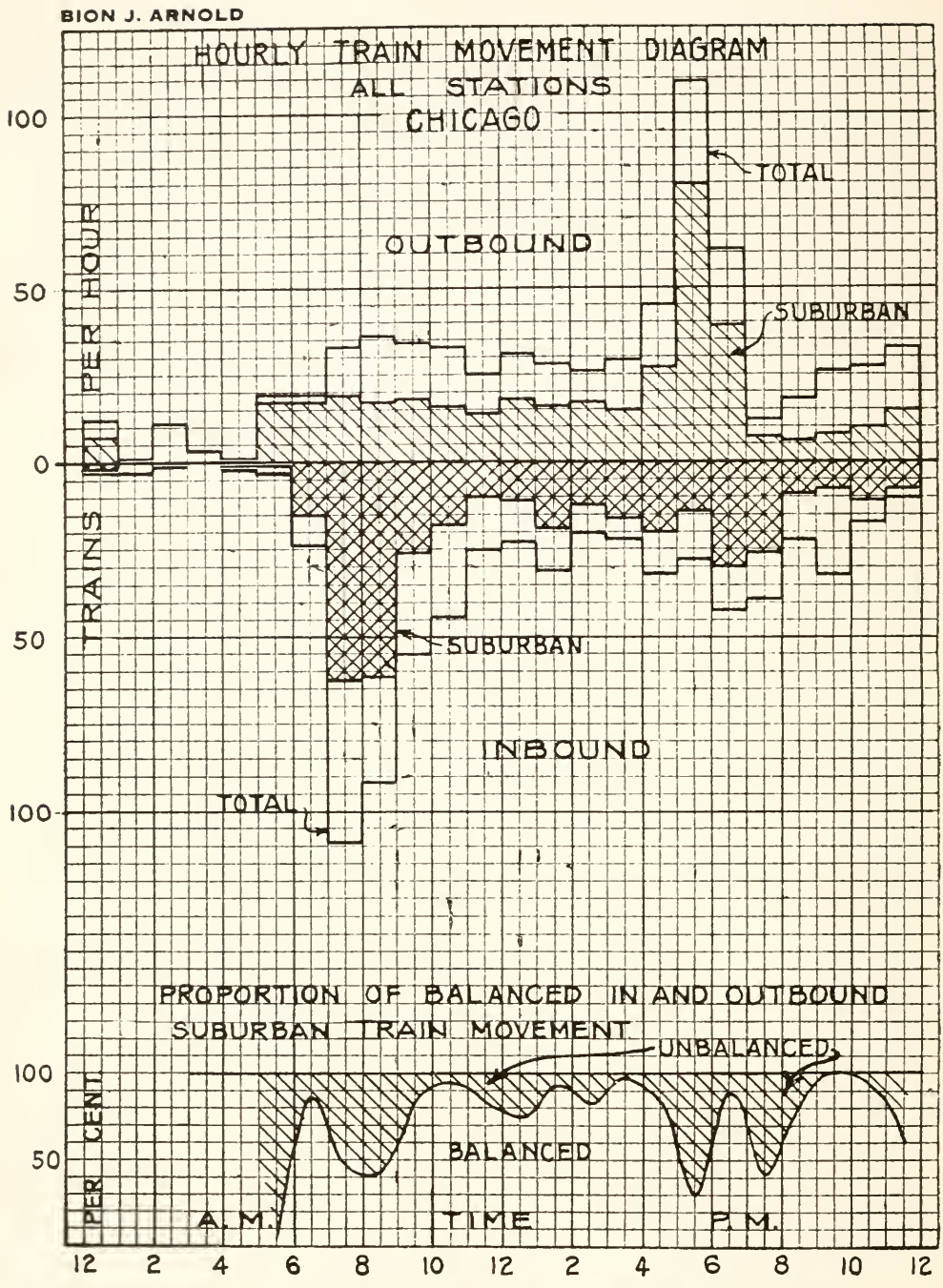

FIGURE 43. HOURLY TRAIN MOVEMENT DIAGRAM.

Showing the hourly variation in through and suburban train traffic in and out of Chicago and the concentration of traffic, especially suburban, during the rush periods. The peak load traffic, 60 per cent to 70 per cent of which is suburban, indicates the desirability of ultimately separating these two classes of traffic and retaining expensive terminal stations for the use of main line trains only. The unshaded portion of the lower diagram represents the small proportion of the suburban business, about 30 per cent to 40 per cent of the total during rush hours, which could be through routed.

Therefore, the best that can be done is to through route during the entire day such service as is balanced, which on certain lines would probably be insufficient, in itself, to provide a fairly frequent service.

However, while the possibilities of complete through routing are limited at the present time, it is believed that the establishment of such a plan would tend to develop this interchange suburban traffic rapidly and thus not only benefit the city but also prove profitable to the railroads.

Interchange of Coach Yards: The very limited amount of balanced service for through routing from suburb to suburb does not necessarily prevent the application of the through routing principle in the form of "lap-over" operation, *i. e.*, North Side trains running through to the South Side of the business district and vice versa. In fact, the convenience of the great majority of suburban passengers would be sufficiently served if access to the business district could be had for its full length; as is now provided by the Illinois Central Railroad. Suburban service is, in a large measure, a terminus business, as shown by the fact that a large number of the passengers alight at the first inbound stop. But the convenience of through suburban passengers requires consideration also, and the most practicable plan that seems to be available at the present time is as follows:

1 Through routing of all balanced traffic from terminus to terminus.

2 Lap-over operation of unbalanced rush hour traffic across the business district.

3 Interchange of coach yards for this lap-over traffic.

Ample coach yard space for tenants appears to be available on the I. C. R. R. right-of-way south of 12th street station and this should not be objectionable with tracks both depressed and electrified. Space can be developed, if not now available, in the North Western coach yards west of Goose Island. Other similar interchange arrangements could un-

doubtedly be worked out for any suburban traffic that might reasonably develop. The economic problem involved in such an interchange is to determine the probable increased revenue to be derived from such operation and compare it with the cost of accommodating tenants plus the cost of operating the extra mileage required to serve the full length of the business district, with coach yards located as at present. At the present time the cost of operating this extra mileage seems unimportant, except in the case of the Illinois Central, for it involves continuing the run of any train forward only about the same distance that this train would ordinarily run dead to reach its present coach yard. This would make only one additional stop for the Illinois Central to the north of its Randolph street station (see Fig. 44); one or possibly two additional stops for the North Western to the south of its main station at Madison street and none for the Fort Wayne and Burlington in their present location. In the future this will be greatly altered due to the expansion of the business district to the north, south and west, which will necessitate a longer over-lap for each road to reach across the business district for the proper distribution of its suburban traffic. And further, the logical outcome of this over-lap operation in the future will be the development of local business areas centering near railway stations established along the various rights-of-way, and as the intervening areas gradually develop into commercial territory the necessity for this over-lap service will become greater, eventually resolving itself into true suburban through route service from terminus to terminus. *In other words, the present arrangement of railway terminals in Chicago is no criterion of what the future development in this respect should be, and provision ought to be made now for the more efficient method afforded by suburban through routing.*

Interchange Freight Lines: The need of a distinct rail connection between the North Harbor and Clearing, via one of the belt lines, has been developed under the discussion of

freight handling methods in Section 5. This is necessary to enable the fullest use of the piers now under construction by the city and those that may be built in the future for the purpose intended, viz.: package freight handling, making it unnecessary for deep draft vessels to ply in and out of the Chicago river.

Various routes have been examined for this rail connection including the present North Water street route of the North Western Ry. While this existing route could be used for a certain amount of traffic, the fact that it is so crooked and so congested by freight house and industry sidings makes it desirable to develop a new route for the future or as soon as the North Harbor becomes a real factor in freight transportation.

A tunnel seems inevitable and it would be best to combine the requirements of the proposed suburban circuit with those of the harbor freight line so that the initial cost of the construction may be justified now. As soon as the increase in either suburban or freight business exceeds the capacity of a double track bore, a separate route under some North Side street, leading direct from the pier to a connection with a Chicago Belt Line, should be built.

Location of Tunnel: For the purposes of the suburban circuit, this proposed tunnel on the North side of the river should be under Ohio or Ontario street, five or six blocks north of the river. This location would place the north link of the suburban route just at the edge of the present retail district which would probably become further developed into dense business blocks due to the expansion of the down town business district. This location also leads directly to the Municipal piers of the North Harbor. To the west, the bore should descend under the North Branch with two connections, one leading up through the Erie street yards of the North Western Ry. to its elevated right-of-way, and the other leading southwesterly to the trunk lines of the North Western (Galena

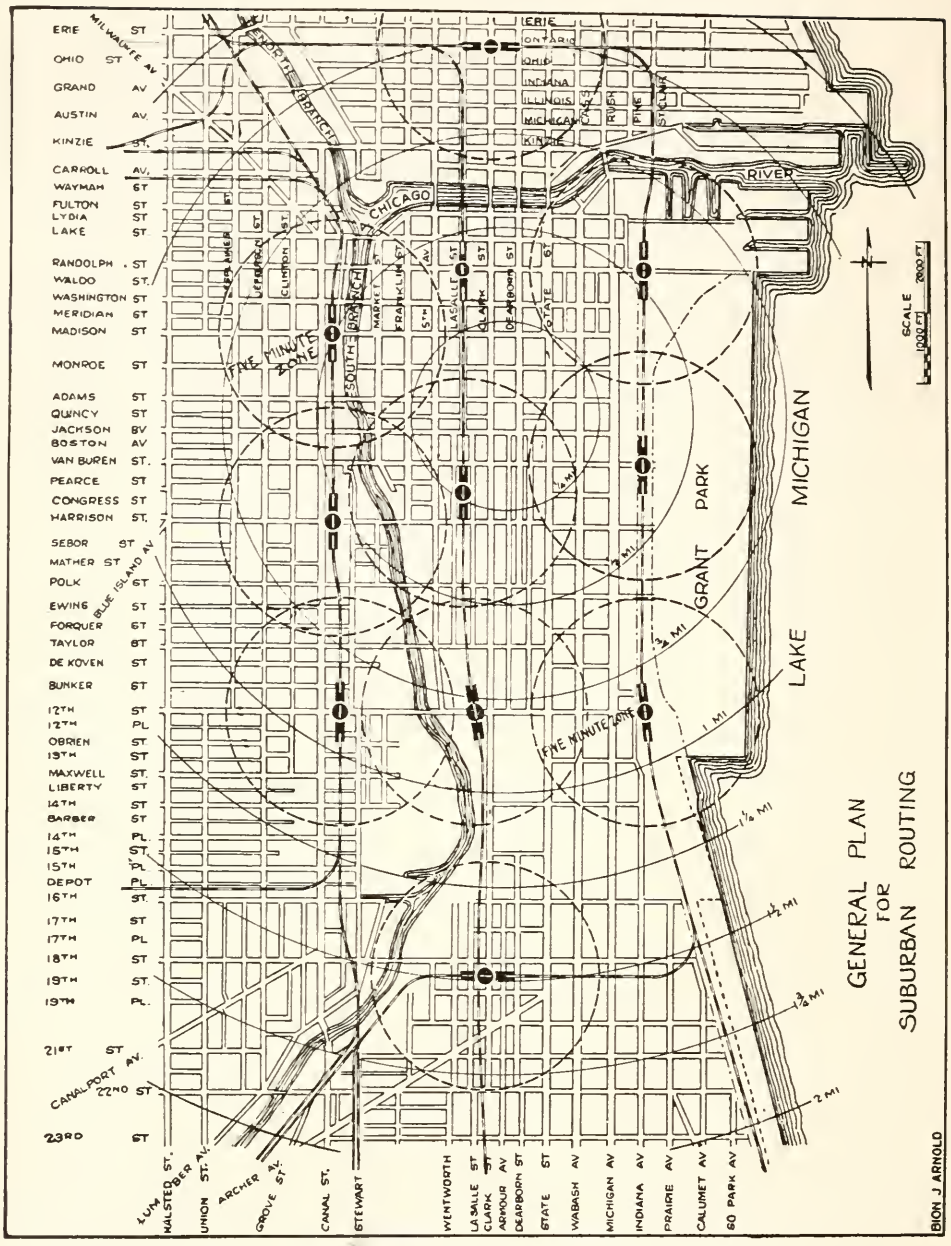

FIGURE 44. ULTIMATE TERMINAL PLAN—SUBURBAN DELIVERY SYSTEM.

This ultimate development of the suburban system is supplemental to the ultimate Four-Station Plan, Fig. 42. It contemplates tracks on the present Illinois Central right-of-way, running north under the Chicago River and Ontario Street to a connection with the present North Western and St. Paul tracks; also a route north and south near Canal Street, connecting with the North Western and St. Paul and Burlington tracks. A third route through La Salle Street bisects the business center, by subway, north of 12th Street, the present La Salle Street Station being used as a Union Suburban Station similar to the Hudson Terminal, N. Y. An east and west connection to the Illinois Central Station, south of 18th Street, completes the system. The small circles show areas included within five minutes' walk from the suburban stations.

Div.), St. Paul and Pan Handle, thus providing a connection to the Belt Line for freight. This tunnel would pass beneath the proposed Clark street and State street passenger subways to the North side and at one or both of these points a suburban station could be constructed with direct physical connection by stairways to the subway stations which will presumably be located at this point, thus affording steam railroad passengers the most convenient transfer to all points of the city.

Figure 44 shows the general location and alignment of the tunnel link in relation to connecting steam lines and probable subways.

East and West Side Links: The grade and alignment of suburban tracks along the Illinois Central Railroad right-of-way depends largely upon the ultimate design of the station at 12th street; but preferably they will be lowered to subgrade, especially if continued under the Chicago river by tunnels. In the development of the Illinois Central right-of-way southward, the suburban lines will remain nearest to the western boundary line. This practically necessitates a dip beneath the first floor tracks at 12th street to clear baggage, mail and express sidings, and the first floor concourse if a stub station is used. In this case the suburban tracks would presumably remain at sub-level to the north in order to pass under the river. And in this connection, a depression of the grade of the present right-of-way of the Illinois Central Railroad should also take place from Randolph street to the beginning of track elevation near 50th street.

The grade of the western link along the Pennsylvania right-of-way, if the Harrison street site is used, may remain at the level of the main station until all the tracks are required for through business, when they will have to be depressed to sub-level as along the Illinois Central side, and in any event depressed if the Adams street site is used. In this connection the depression of the entire area lying between Canal

street and the river should be considered and, if found advisable, carried out at the time of the straightening of the river, in such a manner as to allow the bridges across the river to be lowered to the lowest practical grade, and at the same time maintain the proper headroom for river traffic under the bridges.

For the present, at least two suburban tracks should be provided for, through the loading and unloading territory (and four at stations) preferably next to Canal street on the west and Michigan avenue on the east (as at present), with a four-track tunnel on the north, branching into two-track leads to the North Western and to the St. Paul rights-of-way; the latter two being used for the freight connection between the lake front harbor and the belt line.

At the present time the need does not appear for a tunnel curve connection from the north end of the Canal street link, either to the east or to the west at sub-grade; however, such connections can be built should it become desirable to lower the suburban tracks.

The successful evolution of this suburban through-route plan evidently requires the close co-operation of all roads, including the Pennsylvania; for it is desired that the suburban service shall straddle the business district to the maximum extent without primary regard to individual interests. Compulsory co-operation with the other roads in carrying out such a plan should therefore form one of the considerations of a franchise for any road to construct a new railroad terminal in Chicago.

SECTION 11.

MODIFICATIONS IN TERMINAL ARRANGEMENT.

Having in mind these schematic plans for the progressive development of terminal facilities, we are confronted with the question whether areas occupied by railroads are sufficient for the accommodation of these modified terminal plans without necessitating the acquisition of more expensive property in the heart of the city. Much light is thrown on this question by the results of a general survey of terminal area now occupied, as shown in the accompanying map, Plate IV. This record indicates not only individual ownership of the underlying property, but also the present condition of occupancy; and it is apparent that there is so much room for improvement as to render it doubtful if any additional property is needed by the railroads for the development of any reasonable amount of terminal facilities, even for the distant future. Later studies will show how the present areas can be developed efficiently, especially with reference to the large territory between the river and Canal street. This survey of present occupancy shows the following results:

Fully used	61%
Partly used	22%
Not in use	11%
Private occupancy	6%
Total areas capable of further development	39%

Thus, over one-third of this area lying between Canal street and the Chicago river is capable of being developed more efficiently. And it should be said that the areas designated "fully used" have reference only to the present type of freight development, *i. e.*, the usual single story houses. But, with two precedents before us of intensified use of freight areas in the Soo terminal (two story) and the proposed Pennsylvania terminal (three story), it is only reasonable that equally efficient utilization of the areas under discussion may

be demanded. This survey further brings out the following facts:

1 No effort appears to have been made to develop any of this property along modern lines as regards either freight facilities or commercial uses.

2 The absence of any expensive development in the Burlington properties south of 12th street leaves a free hand to railroads along Canal street.

3 The large tract held by the North Western Ry. south of 14th street, and practically unused except for storage of bulk material, illustrates, from the city's view point, the result of "tax free" railroad occupancy and how needed land may be held out for trading or increment in value.

4 The proposed terminal modifications of the Union Station Company give no indication that intensified use of the existing freight areas is contemplated in the near future. It is really the crux of the problem.

5 The peculiar shape of the various railroad holdings prevent to a large degree, efficient development of these areas such as will be possible if they are pooled.

From the above it is clear that if efficient development is to be expected within the areas now occupied, the railroads must agree upon a plan of harmonizing individual interests in a broad plan of co-operative development.

Passenger Terminal Modifications: As a result of the previous discussion of possible railroad regrouping, certain clearly defined alternatives have been developed for final consideration as to site and general development of contiguous territory. These various alternatives are here presented as studies only, with no attempt at finished design, as such designs should be worked out in detail by the roads interested. Only such general principles are here discussed as seem essential to the successful working out of the plans as a whole.

Of the above plans the Illinois Central and West 12th street sites undoubtedly present greatest opportunity for expansion, the Harrison street site next in order, and lastly the present Union Station site on Adams street, with no future capacity.

If the Pennsylvania Company retains its present site on Adams street it must give up all hope of future expansion here, and also incur for all time the nuisance of a river crossing. At Harrison street the river crossing would still be objectionable but there would be considerable room from expansion.

But with the river straightened, the logical place for the Pennsylvania station is unquestionably on the east side, south of 12th street. Such a site at 12th street could accommodate the Ft. Wayne, Pan Handle, Alton, Santa Fe and Western Indiana lines without any river or grade obstructions. The Illinois Central site could then accommodate as tenants, the New York Central lines, the B. & O. and perhaps others. There would then still remain a logical demand for a West Side station for the St. Paul, Soo and Burlington lines, which would in turn obviate river and grade crossings and route diversion. A West Side Union Station, if built for these lines only, on the Adams street site, would have ample room for many years and at the Harrison street site still further room for future development of the western traffic.

At the same time the freight facilities so much in demand, could be worked out admirably with the river straightened, each geographical group of roads occupying territory best suited to them with reference to the river. As discussed later, there is ample room on land at present occupied by the railroads for all freight development required for many years.

Scheme of Modified Union Terminal Plans for Consideration.

1 West Side Union Station south of 12th street; two level stub station; south stub elevated; or with a straight-away pull-through station below; 14th street closed; 16th street opened but depressed to two feet above datum, the same as Canal street; three level crossings; B. & O. and Air Line retain access to existing team tracks.

2 West Side Union Terminal with head-house just south of Harrison street, Plate I, II-A and II-B; double stub station with tracks on lower

level to be connected into through station in the future; concourse below at present, later at viaduct level; room for considerable expansion eastward; freight house development ample for approximately double the freight development in present use; coach yards ample for all tenants; river-road provided for; 14th street, 16th, 18th and Canalport through at viaduct level; freight facilities along the entire river provided for; river may be straightened from about Harrison street south without cramping site.

3 West Side Union Terminal on the site of the present Union Station developed to the capacity contemplated, Plate III; river straightened from Van Buren street south along Pennsylvania right-of-way; freight facilities practically equivalent to those in use at present; coach yard space limited; no room for future expansion; 14th street, 16th, 18th and Canalport through at viaduct level; marginalway provided for with freight development; Pennsylvania river bridge near 20th street moved west.

4 East Side Union Terminal on new I. C. R. R. site; two level stub and through station available in addition to through suburban tracks; ample capacity for the future; 58 tracks available for long-distance traffic; ample coach yard space for all tenants but for no freight development; plan contemplates development of other freight and passenger sites for handling tenants' freight business; this site necessitates special transit facilities.

5 The segregation of the suburban from main line business by means of a through routed suburban system, depressed where necessary, and connecting stations so as to permit any section of the suburbs to reach all parts of the business district. (Figure 44.)

12th St. Location: From a review of the numerous plans that have been prepared to show possible station development at 12th street, it is not at all apparent that this location is as impossible as some have claimed. Much depends upon the assumptions made at the outset. If all hope of improving the present relations of the railroad properties in the vicinity of 12th and 16th streets must be abandoned, then the 12th street

site west of the river is probably impracticable for the Pennsylvania and associated lines, owing to the expensive track elevation work already done and the location of the river. None of the 12th street plans can vary widely from the following conditions:

1 Elevation of Ft. Wayne tracks across 21st, 18th and 16th streets.
2 Elevation of 12th street viaduct to somewhere between 28 and 30 feet above city datum.
3 Double stub two-level terminal with central headhouse; St. Paul stub at about 8 feet above city datum and Ft. Wayne stub at 28 to 30 feet above datum; or a pull-through station on the lower deck.
4 Station tracks to be level or nearly so.
5 Sufficient tail-room for standing trains between bridge and first fouling point of station interlocking.

The remaining considerations involved are:

6 Advisability of a double stub terminal, two levels.
7 Disposition of the 16th street track situation.

16th St. Track Re-arrangement: In reaching a decision as to the best method of treating a complex situation such as exists at this location, the safest premise is "the greatest good for the greatest number"; and this report is based upon the assumption of a reasonable amount of co-operation between the railroads. In this case an important north and south trunk line absolutely requires grade separation at 21st street, elevation over the river and grade separation at 16th street. It is, therefore, but logical that the present tracks now elevated south of the river should be continued northward, and, in the case of a station located at 12th street, into the second floor train berths. In this, the Burlington entrance from the west should join.

The lesser interests (from the standpoint of the public) at the 16th street crossing, are as follows: (a) B. & O. entrance from the west, (b) Air Line crossing from the west, (c) B. & O. freight, (d) Burlington freight crossing to the river, (e) North Western freight. With all these must be considered the convenience of Canal street traffic.

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The grade separation at Canal and 16th streets now has two levels; four levels are proposed by the Pennsylvania in its freight plan. If the Pennsylvania overhead freight line is eliminated, three levels remain with Canal street at the bottom.

But the depression of Canal street is undesirable and it should be left free to air and light. With the elevation of the Ft. Wayne trunk line, all east and west lines can retain their present locations (leaving the Canal street viaduct as at present), with the single exception of the Burlington passenger tracks which may be deflected to the south over Canal street and reach the Ft. Wayne elevation by a long radius curve.

At the crossing of this deflected line, Canal street is on ground level, having descended from the viaduct. Thus in this plan, two simple grade separations can be used instead of a single four level arrangement as proposed by the Pennsylvania Company in order to accommodate its freight line. This is only possible because this curve takes advantage of the dip in Canal street between 16th street viaduct and the river bridge.

To this 12th street plan there are objections as follows:

1st Different levels in main station thus prohibiting the eventual development of a through station unless 14th street is not carried through.

2nd The necessity of purchasing some relatively expensive improvements on property south of 16th street to accommodate the entrance curve of the Burlington.

3rd The depression of all east and west tracks on 16th street in order to pass them beneath the north and south elevated tracks of the Ft. Wayne road, which renders difficult an approach for the B. & O. to its freight yards in the bend of the river.

4th The impossibility of opening 14th street.

This difficulty of opening new east and west streets through the territory, now closed, one-half mile long, is perhaps the most serious objection. For with the ground level necessarily occupied by coach yards and the track elevation continued across the river, there is no alternative except the elevation

of 14th street to perhaps 50 feet above datum, which would be useless for purposes of vehicular traffic.

Harrison Street Site: All these objections to the 12th St. site may be avoided by using Harrison street as the terminal site. Both north and south sections may be located on the ground floor level at about five feet above city datum, or lower if the entire area between Canal street and the river is depressed; and while built first as a double stub station, the tracks may be *later connected as a through station* when traffic demands. Grade separation over 21st, 18th and 16th streets is practicable with main line tracks descending on an easy grade to ground level before reaching the throat, so that both station tracks and interlocking will be on level ground. The relation of east and west tracks and Canal street viaduct can remain as at present with but a slight depression of tracks, still retaining access to the B. & O. yards and the Air Line bridge with a grade not exceeding 1½ per cent. The Burlington passenger tracks can continue on the ground level with a curve into the west side of the south station thus avoiding any crossings of the Ft. Wayne tracks, i. e., practically as at present, involving only an interlocked crossing with B. & O., Air Line, and North Western freight tracks. Thus the principal change over the present track arrangement is the elevation of the Ft. Wayne tracks. However, there is a means of avoiding all grade crossings by the Burlington crossing over the North Western between Ashland avenue and Throop street from the south to the North side, following the B. & O. right-of-way as far as 16th street with only a branch off at this point instead of an interlocked crossing.

And in connection with this plan, it must be borne in mind that the logical terminal entrance for the B. & O. passenger trains is the Illinois Central 12th street terminal as in former years, rather than the Grand Central Station. Similarly, the Chicago Great Western could follow the Burlington into this proposed Harrison street station. This would remove the

principal disturbing factor at 16th street, leaving the Burlington practically free access to the West Side Union Terminal. As this is the only logical Burlington entrance, it is reasonable to give it the right-of-way and any freight crossings must be secondary to it, particularly the North Western tracks which are only for a stub freight service.

With the station headhouse located south of and abutting on Harrison street widened, as herein proposed, the terminal property would thus be in a most advantageous position, not only with reference to a possible future civic axis of the city but also to the probable main subway system of the city passenger service, for practically all those who have submitted reports upon a passenger subway system for the city, agree that one of the principal subways will be on Harrison street. This site would also give easy access to both viaduct and street level and allow a concourse below for some years to come as in the proposed Union Station plan.

A rearrangement of railroad holdings south of the station would be necessary to so relocate the coach yards for both owners and tenants, as to leave sufficient space for express buildings or commercial building development facing on Canal street, and for freight development west of the coach yards.

Fortunately, 14th street can be opened in any of the Harrison street plans, by carrying it over the tracks at viaduct level, for the crossing is far enough north to permit the Ft. Wayne tracks which must come in at an elevation to reach ground level. At the same time 16th street and 18th street may be carried over or under the Ft. Wayne main line (depending upon the plan adopted. See Plates I to III), and an additional street, Canalport avenue, opened to the important intersection of 16th street and West river-road.

As between 12th street and Harrison street for a location of the new West Side terminal, the Harrison street site possesses the greater advantage physically. The relation of these sites to other proposed sites in the general scheme, is discussed elsewhere, Section 10.

Two arrangements of coach yards are shown, Plates IIA, IIB, both giving free access to standing tracks for cleaning and storage without interference with the main leads and of sufficient capacity to serve the stations as shown, and with a margin for future expansion.

The plans shown on Plates IIA and IIB provide for about 425 and 216 coaches respectively.

From the above it is clear that with so many possibilities of evolving a better terminal scheme than those immediately in view, it would seem most reasonable for the Pennsylvania to build for the future as well as for the present. There are two alternatives open:

1 Adherence to the present site.

2 Partial or temporary use of the present site and development of a future site.

In case the Pennsylvania Co. refuses unconditionally to leave the Adams street site, it should be content with a river crossing and with a maximum development of that area now occupied by railroads and lying west of the straightened Chicago river, running south from Van Buren street contiguous to its right-of-way, and in addition, bear its share of the cost of river straightening in connection with the other railroads. This will be the price of a refusal to move southward now. See Plate III.

On the other hand, if the Pennsylvania conforms to the policy of recession with its principal terminal station to Harrison or 12th street, developing the northerly site for suburban use only, it will not only show a proper spirit of cooperation with the city and the other railroads but will also derive a return in the way of room for further expansion which it will sorely need if it chooses to remain on the west side of the river and continue its joint relationship with the other roads associated with it in the Union Station Company.

And finally, if the Adams street site were developed on a moderate scale for accomodating both through and suburban

business of the immediate future with the object on the part of the Pennsylvania of eventually releasing the terminal for the use of the Burlington, St. Paul, Soo and other lines, which naturally belong west of the river, and transferring its terminal to the east of the river and south of 12th street, where it most logically belongs, then the maximum possibilities of future development for the Pennsylvania Co. would be available without excessive expenditures at present for a terminal which will soon become inadequate on account of lack of capacity, as it cannot be enlarged eastward (as could the station if located at Harrison St.) on account of the fact that the station if built as planned occupies the entire space between Canal street and the river and the river at this point cannot be changed.

Illinois Central Lake Front Site: The peculiar advantages of this site have been brought about by the contract recently entered into between the Illinois Central Railroad and the South Park Commission, through which the Company is granted considerable room for the future extension of its terminal facilities and rights of way, in return for which the Company gave up its Park Place property, and agreed to build a new station, thus making possible the opening of 12th street to the Lake, in accordance with the recommendations of the Chicago Plan Commission.

Studies of the possibilities of this new location indicate that a very large capacity is available, greatly exceeding any possible future needs of the Illinois Central Railroad alone, at least for many years. The studies further indicate the desirability of a two-level station co-ordinated with the respective levels of the street and the proposed 12th street viaduct. The ultimate development of this plan permits about 29 tracks on each level, which provides a capacity so great as to encourage the idea of concentrating much of the terminal traffic of Chicago at this site, somewhat as suggested by Mr. Jarvis Hunt for a 12th street site farther west. Not only is ample termi-

nal area available, but also ample areas for coach yard and car storage purposes along the widened right of way extending southeasterly from the station.

Probably the best arrangement for this two-level station would be a stub station, with concourse and waiting room on the upper or viaduct level, and a pull-through station on the lower level. To confine the tracks to the present right-of-way, a head-house would presumably front either on 12th street or on the Indiana avenue frontage. The converging right-of-way north of this assumed position, would then accommodate the north throat tracks of the through station on the lower level; at the south, the right-of-way provides room for any length of station track desired on both levels. This through station plan would practically place all of the station structure north of 12th street below the level of Grant Park, thus offering no obstruction to the lake view and putting to use this territory, otherwise idle or available only for storage.

It does not seem desirable to consider the use of the segregation of inbound and outbound traffic on these two levels, for the reason, as elsewhere discussed in this report (page 115), that the extremely unbalanced conditions at various periods of the day would result in practically losing perhaps 40 per cent. of the station capacity thus operated. On the other hand, some plan might be worked out for grouping the various roads using the station on the two levels.

The suburban feature of this station seems to require special treatment. 12th street at present is little used as a suburban stop. As the business center moves southward and as the lake front development takes place, the station will become of more and more importance, but in the near future it seems unavoidable that all suburban business should be routed through the station to the north yards, particularly if the suburban route previously discussed be adopted.

On the southerly right-of-way the suburban tracks must necessarily be located to the extreme west for convenience of

commuters, as discussed in Section 10. This fact, together with the difficulty of crossing baggage and express yards south of the station, practically necessitates the depression of suburban tracks passing through the station. While in a strictly terminal station, such as La Salle Station, the use of the lower deck for suburban traffic would probably be considered, it does not work out as well in this 12th street site for the ground floor level as for the sub-surface level. Should the proposed suburban through routing to the north side be put into effect, this depression of tracks may then be continued along Grant Park and by a tunnel under the river.

This suburban stop at 12th street requires nothing further than a simple reservoir station, consequently comparatively few tracks will be required, and it is on this account that the depression through the proposed main terminal station becomes feasible. This also leaves the ground floor deck clear for main line traffic with an unrestricted capacity on both floors of 58 tracks. It is contemplated that the upper level of this station will be built first, with the floor below accommodating temporarily baggage, mail, express, etc. Later, these facilities can be located elsewhere.

Freight by-pass tracks to the freight terminals at the north of Grant Park can be located at the extreme easterly edge of the right-of-way without interfering with the development for passenger tracks. Similarly, the coach yards to the south may be located between the suburban and main line lead tracks, so as to avoid much of the switching interference at the main throat. This new site practically necessitates the abandonment of the present St. Charles Air Line, on account of the impossibility of reaching both station levels. However, a new location may be found for this line a little farther south, at about 18th street, which would have the further great advantage of simplifying the present grade separation problems at Clark street and at Stewart avenue. The abandonment of the present St. Charles Air Line crossing in 16th street seems

a possibility, inasmuch as this line is no longer used for passenger service from the west, and only for incidental freight service. With a new location of the line about 18th street it would be possible to bring in the western passenger lines of the Illinois Central south of the river quite as conveniently as at present, while still retaining the freight connection. Both lines should not be permitted.

SECTION 12.

FREIGHT TERMINAL FACILITIES.

In the preceding discussion of passenger terminal modifications in Section 11 an effort is made to indicate the maximum development of available existing areas. It remains to apply the same methods to freight sites. From a survey of occupancy it would seem that the limitations of present freight areas available for freight handling are not the only motives actuating the railroads to increase their property holdings in the heart of the city. Consequently, the question arises whether it is possible to find sufficient area within the present holdings to develop the necessary freight facilities sought by the Pennsylvania Railroad in its pending ordinances. The following method is pursued in arriving at this result:

1 Area actually useful and necessary for handling present tonnage.

2 Area to be saved or released by L. C. L. interchange clearing plan.

3 Area necessary for intensive freight development on the two-story plan.

4 Increase in area necessary to accommodate probable growth per decade.

5 Capacity of existing areas under various plans of development herein contemplated.

6 The failure of the railroads to develop any of the ground lying within the bend of the river from 12th

to 16th St. may indicate that the straightening of the river is anticipated, consequently several plans of development are shown with the river straightened.

In this analysis an attempt was made to develop individual properties independently but the results were so unsatisfactory as regards the interests of either the railroads or the city that this plan had to be abandoned and the properties developed as they probably would be in case certain interests were pooled.

The following assumptions are made:

1 Two-level freight house construction with or without industrial development above.

2 Only such team tracks as are absolutely necessary for the downtown district and as are justified in this valuable territory.

3 Car storage capacity for holdovers and empties absolutely limited to the necessity of normal switching operations. Every effort should be made to restrict the use of standing cars for storage purposes and piecemeal delivery; all necessary holding to be done in storage houses rather than in cars. This constitutes the best possible argument for the development of "air rights" for storage and commercial purposes above the freight platforms, *i. e.*, what is known as "intensive" development. For example, the "Cupple" warehouses, St. Louis.

4 Reasonably efficient methods provided for the mechanical handling of rough materials, such as building material, thus economizing in team track space by providing for more rapid unloading.

5 Intensification of the use of the more expensive property closest to the business district, using the upper floors for warehouses, manufacturing, or office purposes, according to the location as may seem desirable.

Present and Future Facilities: Considering the so-called downtown district as bounded by Chicago avenue on the north, Halsted street on the west, 22nd street on the south, and the lake front on the east, the relative utilization of these facilities has been studied by the following groups:

(a) East of the river, Harrison to 22nd St.
(b) West of the river along Canal St.
(c) North and northwest of the river.
(d) Lake front south of the river.

The survey of the present railroad occupancy shows that a very large acreage is occupied by team tracks. Thus, considering only the freight areas east and west of the river, and exclusive of idle tracks, the following results appear:

Per cent of total car standing capacity used for team tracks 56.8%
Average area actually used per standing car ..... 1236 sq. ft.
Average area per car moved per day.... 6180 sq. ft.

A particular example of the inefficient use of downtown area is that of the North Western Ry. in the bend of the Chicago River north of 16th street. Car capacity 92, cars moved per day, 9; thus, this important area, which may be considered in some respects as the key to the 16th street situation is used to less than 10 per cent. of the capacity of the tracks only.

Summarizing the areas, house and track capacities, and tonnage handled by each of the occupants of the downtown terminal areas, the following results appear:

1 On a basis of *car standing capacity* the average road requires for an inbound house 1740 square feet of total ground area per car, and for an outbound house, 936 square feet per car. Team tracks require from 705 to 1600 square feet—total area per car, averaging 1236 square feet.

2 On a basis of *actual tonnage handled* upon platforms of inbound houses, the range is from 36 to about 382 square feet of platform used per ton per day. Average, 132. The outbound houses range from 29 to about 150 square feet of platform used per ton per day. Average, 80. At combined in and outbound houses the range is 34 to 86 square feet of platform used per ton per day. Average, 54. Team tracks use from 102 to 1165 square feet ground area per ton handled, averaging 297 square feet. Except for the fact that in C. L. business. cars are loaded about 3⅓ times heavier than in L. C. L. house business, the relative inefficiency of team tracks would be greater.

It thus appears from the above that present freight development requires almost twice the platform area for inbound as for outbound business, and for most efficient development along intensive lines probably this ratio may be even higher. In these studies this principle of apportioning areas according to the character of the business has been followed as far as possible to best fit into the ground areas available.

This analysis shows that some of the roads are utilizing their platform areas to much better advantage than others, and on a basis of tonnage per standing car track capacity some of the roads are using their space over four times as advantageously as others. This may in part be due to the difference in commodities handled, volume of business done or management.

In the case of an inbound house, the capacity is primarily dependent upon platform space available, because inbound freight must be stored from one to three days and often longer before delivery. On the other hand, the capacity of an outbound house depends largely upon the number of cars that can be spotted at one time and the number of pull-outs per day. These vary greatly in the Chicago terminal district. The majority of the roads pull cars once a day; some twice a day, or oftener, thereby increasing the use of their platform facilities.

As a general result of this analysis of the freight handling facilities in the Chicago city terminals, the wide diversity as to results obtained by various roads with present facilities, indicates the measure of improvement that may be made. And it should be upon this increase in the efficiency of handling and management combined with better use of present sites that the railroads must depend for the increase of their Chicago terminal capacity, rather than upon large increase in realty holdings in the downtown district.

It would seem to be poor business policy that property worth perhaps $40 per square foot should be occupied by one-

story freight houses in which the interest charges often amount to $1 to $2 per ton of freight handled. It is possible by rearrangement of trackage and buildings, to locate, over the tracks, buildings for manufacturing industries, warehouses and other commercial purposes, thus reducing the overhead costs to the railroads and enabling the tenant occupying such a building to receive freight direct from the railroad, to manufacture or store it, and to re-ship without cartage expense or encumbrance to the streets. A few cities, viz.: New York and St. Louis are doing this to a certain extent, but not as intensively as seems desirable here.

The two examples before us of a more intensified use of present freight areas, viz.: the new Soo Terminal at 12th and Canal streets, and the proposed Pennsylvania freight terminal between Jefferson and Desplaines streets, offer a precedent which has been accepted in general principles as an attempt toward improvement, and used in the plans presented in this report, *i. e.,* the reconstruction of the present single story freight development west of the river into two-story with commercial development on the upper floors where warranted. Thus, the purchase of additional lands is avoided and the plan better suits the general scheme of viaducts over the river and property between Canal street and the river, providing:

1. Access to all houses from the viaduct level.

2. Access to a large proportion of the houses and to all team tracks from the lower level.

These studies show, except for the one wherein the river is straightened from Van Buren street south, Plate III, the freight house capacity available not only exceeds that of the present time but also provides collectively for perhaps 15 to 25 years' normal growth in the freight business. And, even this most restricted site would enable the roads interested to operate as well as at present, pending the development of additional facilities on the east side of the straightened river. And finally, these areas moved to the east side

by the straightening of the river offer sufficiently wide margin for reasonable future development. In one study, team tracks to the west of the river have been provided exceeding in capacity those of the present and giving the Pennsylvania lines more than they provide in the proposed new elevated terminal.

The conclusion from these studies as summarized in the main report, is, that if the railroads will exercise the necessary co-operation in the development of their properties it will be unnecessary to acquire further lands on either side of the river, or in other words, the city can take the position that the new Pennsylvania freight site is unnecessary. If the Pennsylvania company persists in its determination to develop this site, the city should insist that the plans be so modified as not to interfere with the development of the Chicago plan. This can be done by so building its freight houses as to keep all standing teams off the streets and all tracks depressed and covered, which can be done with practicable gradients in one or more ways, so that the streets would not be blocked or interfered with in any way.

SECTION 13.

INTER-CORPORATE RELATIONSHIPS.

From the preceding discussion it is evident that the only hope of securing the much desired readjustment of terminal facilities, both freight and passenger, lies in the peaceable submergence of the individual for the common good both as regards passenger and freight facilities. This does not necessarily mean the relinquishment of undoubted advantages in location now enjoyed by certain roads, for these advantages if they have been rightfully obtained, constitute unquestioned legal and moral equity which must be recognized in any such readjustment. However, their advantages may not necessarily be permanent due to the changing conditions and growth of the downtown business district.

It has been insistently stated by those favoring adherence to present conditions of independent operation of terminal properties that any readjustment in the slightest degree would immediately become unfeasible if the railroads involved were called upon to relinquish for public use any of the property now held, by reason of the overlying mortgages thereon and the practical impossibility of securing the consent of both trustees and stockholders in any such change, at least within a reasonable period of time. This position is believed to be untenable and does not adequately meet the demand for immediate change:

1 The railroads are not asked to relinquish any property outright by forced sale or discounted lease.

2 The pooling of railroad realty, operating rights and equities have been voluntarily carried out in so many instances that no further precedents need be invoked.

In certain cases of recent efforts toward pooling of terminal rights failure has resulted but only through the inordinate demands of some participants claiming more than the lion's share. But the Washington Terminal, the St. Louis Terminal and the Kansas City Terminal offer ample justification for the movement now under way in this city.

As indicated in the preceding paragraph the intensive development of existing railroad property in the terminal district for warehouses and light manufacturing offers far greater possibilities for lucrative investment on the part of the railroad than the present inefficient use of these same properties offers—disregarding entirely the interests of the municipality and its citizens. And it is a foregone conclusion that an expressed willingness on the part of the railroads to meet the public demand (providing their legitimate rights and holdings are not jeopardized) will secure for them far greater concession than can possibly be secured by a continuance of an attitude of selfish disinterest in the city's welfare which has too often characterized railroad and other corporate operations in many cities of the country.

In the end history records that the demands of public opinion when concerted will prevail. A case in point is the recent fruition of the long continued efforts of the citizens of Philadelphia to secure an open access to the water front of Philadelphia (heretofore held exclusively by the Pennsylvania Railroad) to all railroads through the agency of the belt line. And the final fruition of the Chicago clearing plan by virtue of necessity, if not by voluntary co-operation should establish all the precedents required in railroad development in this city.

But it must not be assumed that the entire burden of all these expensive changes both as to the initiation and execution can be loaded onto the railroads without being shared by the city. Not only is the joint action and consent of the city necessary but the city must expect to bear a reasonable share of the responsibility and expense as well as enjoy the fruits of such a plan of development. The radical nature of some of the changes involved border on dispossession of railroad interests, and a far-sighted appreciation of this fact by the city authorities combined with an honest effort to share the burdens should offer sufficient encouragement to the railroads to "mend their fences."

One phase of this question which would seem to call for special consideration by the railroads and previously referred to in the main report, is that the public expects concerted action, at least from affiliated roads, if not from all roads, in a plan of terminal rearrangement such as the proposed one. If a certain group of roads finds it practicable to join in a union terminal plan they may reasonably be expected to work out a similar joint freight plan. In the present instance the Pennsylvania is the first of the west side group of roads to declare its plans for a terminal development. There remain the Burlington, St. Paul and Alton, each of which declared its intention to expand its facilities. It is known that the Burlington has acquired large holdings for this purpose. It is,

therefore, reasonable to expect of these roads a more definite declaration of their plans as freight terminal development has now become too serious a matter from the public standpoint for individual treatment, especially in view of the irregular nature of the holdings and the difficulty of developing them efficiently; for example the case of the Pennsylvania.

As a premise to this report this freight development has been considered as a joint proposition, the internal relationships to be worked out by the roads interested and the results to be submitted collectively for public approval.

SECTION 14.

POWERS OF THE MUNICIPALITY.

A very general review of the present scope of municipal and state authority seems to suggest opportunity for the solution of this problem by sweeping away many of these supposed obstructions and impossibilities which public opinion, long used to forbearance, has imagined to exist; and it is believed that municipal authorities now possess directly, or the state and governmental authorities indirectly, certain powers as follows:

1 To execute modifications and improvements in the city plan.

2 To control encroachments and execute changes in navigable streams.

3 To prevent interference with the grade and continuance of established thoroughfares.

4 To compel the opening of new thoroughfares where needed.

5 To compel grade separation by track elevation or depression.

6 To control the development of industrial sites where damage to contiguous property is involved.

7 To establish commercial centers at logical points, with transportation facilities the result rather than the cause.

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8 To control, through police power, the congested conditions of municipal thoroughfares and to suppress nuisances.

9 To control through the withholding of grants for rights of way, undesirable railroad development.

10 To rescind temporary rights and advantages granted in previous ordinances.

11 To secure desired re-adjustment in site by granting equivalent facilities elsewhere.

12 To equalize taxation on railroad and private property by rescinding or refusing to grant concessions and subsidies, the necessity for which may have long since passed.

It is frequently cited that the fatal delays in legal proceedings offer a practicable, if not a theoretical barrier to any proceedings which might be instituted by the city in enforcing its demands owing to the quick recourse to the courts which generally characterizes the attitude of influential corporations in real or imagined grievances. *But on this hypothesis, all progress must evidently stop.* And in the face of its clear and unquestioned power the conclusion cannot be avoided that an enlightened public opinion and a determined municipal administration constitute the only real essentials in any reasonable progress of municipal improvement in which the cost and the burdens involved are equitably distributed.

A case in point is the successful evolution of the traction ordinances of 1907 after a long period of determined effort by the citizens of Chicago to improve conditions of transportation which the corporations failed to improve when the opportunity lay within their grasp.

It is not the intention or object to reflect criticism upon existing or previous administrations or corporations for this condition but simply to emphasize the fact that with adequate public support reforms can be carried out which utterly fail of fruition through technicalities in the law without constant vigilance on the part of the public authorities.

One of the greatest dangers to real municipal progress is the

prevalent tendency to permit *expediency* rather than far-sighted permanent development to control the immediate future. This may arise from a mistaken policy of supposed administrative economy which turns out in the long run to be the most expensive. Civic development cannot be bartered or parceled out without the most serious consequences for the future and it is firmly believed that the railroad terminal situation in Chicago has now arrived at a point where the interests of the municipality must be conserved in the most determined manner or the commercial welfare of the city will be surely jeopardized for many years to come.

Taxation: The present scheme of taxation of railroad property within this city and elsewhere has been severely criticised because of the disproportionate burden placed upon the city taxpayer through the existing method of assessment. In accordance with a decision of the United States Supreme Court, it was deemed proper that railroad taxation should be spread over the entire country on a per mile of right of way basis. In Chicago, railroad property is assessed at the extremely low rate of around $40,000 per mile of right of way which is but a fraction of the assessment levied upon the adjacent private property.

For this reason, any additional private property sold to railroads represents just that much value removed from the taxable property lists and a direct loss to the city. This imposes an additional burden on the private property owner in the city, and subtracts correspondingly from that of the country through which the road runs.

Out of this conflict of principles the fact appears that the real reason for opposition to railroad occupancy is because, when once obtained, the roads make no effort to improve the property for maximum usage, but allow it to be put to any purpose that suits them regardless of how such use may depreciate adjacent property. Were the roads as heavily taxed on the real estate they own as owners of similarly located

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private real estate are taxed, there would then be created a strong incentive to develop intensively such railroad property in order to support the tax. But, with such property relatively tax free, it is difficult from the public viewpoint to tolerate the present railroad policy of non-development in cities whose needs require such maximum development and which the best interests of both city and railroad demand. As an indication of future policy the improvement and maximum use of present properties should be the first step to be taken by the railroad companies instead of still further increasing the congestion which they themselves, to a great degree, have brought about during the remarkable growth of the city and surrounding country in whose development the railroads have had so important a part.

SECTION 15.

SUBJECTS REQUIRING FURTHER INVESTIGATION.

It will be evident from the foregoing that in order to determine finally many of the important points involved, further investigation is unavoidable. The problem in hand is most emphatically broader than the simple terms of an ordinance, although that is the end in view. But the time is at hand for the fixing of a policy for the future, both on the part of the railroads and the city. While these policies may perhaps be anticipated to a certain degree in this report, some definite idea of the costs and results, at least for the near future, is necessary to convince those to whom the execution of these policies is to be entrusted.

1 The net results of the contemplated re-arrangement of terminal properties and passenger entrances between the railroads interested ought to be worked out, in order to show in detail the saving in train time and operating costs, the saving in crossing and bridge obstructions, the improved access to these terminal facilities by the public, and the future in-

crease in value of the re-arranged properties, due to their better location with respect to the enlarged business district; all this as balanced against the cost of executing the earlier portions of such a program.

2 The basis for an equitable joint operating lease, or pool of present railroad terminal holdings, should be investigated, in order that the interests of the minor roads as well as of the major or proprietary roads should be conserved.

3 Before the acceptance of a definite re-routing plan for railroad entrances can be with justice demanded, a careful study of the existing balance of interests and of all the physical track connections, existing and proposed, must be made within the district affected. This is necessary to conserve the track elevation plan and avoid, as far as possible, the repetition of such complex track lay-outs as now exist at 16th and Clark streets.

4 The best method of encouraging conformity to a logical plan in the intensive use of railroad properties released and developed for commercial purposes should be studied in order that further mistakes should not be made in leaving to individual judgment the creation of the commercial properties along lines that happen to be best suited to the needs of the moment. In other words, the city should now exercise, in a limited way, a control over building development, to bring about the maximum results from railroad vacation. For example, many of these plans propose freight facilities in the basements. Obviously this throws just as great a burden on the streets so far as team traffic is concerned as if the same facilities were located on the surface as at present, and unless additional streets are provided, the purpose of the entire plan will be defeated.

5 Unquestionably, there is need for a broad and harmonious architectural treatment of this future development in terminal properties, both freight and passenger, which should be conserved by some method of joint study and control in which

all proprietary roads as well as the city can actively participate.

6 The legal phases of taxation in the development of "air-rights" of railroad property released for commercial purposes, should be studied with reference to the equitable adjustment of the burden of taxation upon the railroads and adjacent property owners respectively.

7 The status of existing laws and ordinances should be investigated, as to existing rights, privileges and obligations of railroads, the rights of the city in the Chicago River water front, conveyed in perpetuity by the national government and the power of the city to vacate in perpetuity dedicated streets for private use without authorization by the state.

8 The policy of the city in regard to future concessions of rights-of-way and street modification, should be studied so as to secure the maximum benefits to both railroads and city without the latter relinquishing its control in perpetuity over areas whose ultimate reclamation may be essential to an effective City plan when expansion shall demand a change. The net results of changing the course of the Chicago river, by straightening the south branch, should be worked out, both as to benefits and assessments with reference to the existing and proposed railroad occupancy.

9 The cost and volume of the transfer business through the downtown district due to distributed terminals ought to be determined for the purpose of evaluating the comparative advantages of regrouping properties in any plan of terminal consolidation. This refers not only to passenger, mail, baggage and express, but particularly to package freight, for which the ton mileage incurred in transfer forms a proper basis of study.

10 The possibility of development of more convenient and accessible facilities for water borne freight along the Chicago River in the form of a general system of package freight terminal lighterage and public docks should be determined so as

to reduce as much as possible the street traffic obstructions due to bridge openings without placing too serious a handicap on river shipping.

11 The provision of a belt line feeder connection from the upper Chicago harbor to the union clearing yards for package as well as bulk freight, merits study as the only means of developing these harbor facilities to their fullest use; in other words, to reduce the cost of terminal transfer to the minimum.

12 Following the establishment of bulk freight clearing yards for a large number of Chicago roads, it seems that the commercial feasibility of a similar clearing plan for package or L. C. L. freight should be immediately determined, with the object of relieving the city streets and the downtown terminals of an unnecessary burden of tonnage destined for other roads; and in this connection also the establishment at certain locations of union freight receiving stations operated in connection with this universal clearing plan.

13 A study of the sources of off-time arrivals and departures of scheduled passenger trains, the contributory causes of railroad casualties within the Chicago district and similarly, the causes of freight congestion, delay in transit and car shortages in periods of need, would be fruitful in disclosing methods of operation and avenues of improvement entirely in line with the general recommendations of this report. In this connection the feasibility of a union storage clearing plan for car "empties" so as to avoid car shortage, is important.

14 The location of a more suitable site for a public market than South Water street so as to be more accessible by rail, water and trolley, on the one hand, and more convenient to distributors on the other, and to remove the intense congestion of thoroughfares which now handicap local transportation.

15 The feasibility of using street railways at night for light freight delivery between public receiving and distribut-

ing stations offers a fertile field for study. In this manner the city would derive an income from idle investment; and also the cost of haulage to districts of the city unserved by railroads would be greatly reduced.

16 The use of the Illinois-Michigan Canal bed as a public right of way for entrance to the city and the union clearing yards may possibly offer some natural advantages over its present uses, to simplify the problem of railroad locations as the industrial district expands to the west.

17 The co-ordination of existing steam suburban lines as extensions of long haul elevated and subway lines, existing or proposed, offers a very possible means of more economically serving the enormous area of suburban territory around Chicago than at present with the least total investment and the least interference with the street plan. This is due to the limited number of diagonal or radial thoroughfares in Chicago and should be studied with the object of controlling suburban development in a more logical way than has been possible in the past, when left entirely to the policy of the particular railroad reaching the various suburbs.

18 The probable extent or limitations of the co-operation to be required of the various roads in carrying out a physical inter-connection between entrance routes or stations for the purpose of interchanging suburban service by means of a suburban circuit and possibly requiring the interchange of coach yards.

19 The proper dimensions and proportions of railroad freight house development should be studied in detail, together with the most effective methods of freight handling with reference to the particular class of business to be handled and the territory to be occupied, so that the maximum over-all efficiency of freight handling may be secured, including operating costs, damages and fixed charges.

20 The practicability of a central yard for receipt, inspection and reconsignment of products handled on the Board of

Trade should receive attention, with the object of simplifying the methods and reducing the cost of inspection and the delay in cars which is unavoidable with numerous widely separated receiving yards, as at present.

Similarly, the storage of empties at central point or points where shippers could more readily secure cars on call, might prove worthy of investigation as a means of reducing car shortage.

21 Finally, the most important study to be made is the net financial result in reducing the cost of electrification by re-grouping the railroad terminals and the entrances thereto as herein proposed. While this general subject of electrification is under investigation by the Chicago Association of Commerce, it will not be sufficient to measure the possibility of electrification in terms of the complicated individual ownerships now existing but rather in terms of the net cost of electrifying only such terminals and rights-of-way as appear to be required in the final plan of re-grouping to be decided upon. Manifestly, electrification of all roads entering Chicago would be a great financial burden, and such a proposal just at this time, would perhaps defeat the purpose of its proponents; but it is not at all evident that electrification of certain consolidated properties, especially those carrying the heavy suburban travel, could not be carried out in the near future to advantage. This much is certain, that no terminal plans should be put into execution today without adequate provision for electrification.

Statistical Appendix

STREET IMPROVEMENTS RECOMMENDED.

18th street to be widened from 66 feet to 80 feet between Canalport avenue and Clark street.

16th street to be put through 80 feet wide from Canal street to Clark street.

14th street to be opened 80 feet wide from Canal street to Clark street.

12th street to be widened to 118 feet east of Canal street, and to 108 feet from Canal street to Ashland avenue.

Taylor street to be widened to 80 feet east of Desplaines street. It is now 60 feet wide west of the river and 40 feet wide east of the river.

Polk street to be widened from 40 feet to 80 feet from Desplaines street east to State street.

Harrison street to be widened to 100 feet east from proposed Civic Center.

Monroe street to be opened 66 feet wide from Market street to Canal street.

Canal street to be widened from 80 feet to 100 feet on the upper level from Randolph street to the south branch of the Chicago River. Canal street to be double decked from Monroe street to 15th street, lower level to connect with 15th street at the south, the high level continuing south to the river; connection to be considered between Canal street (at Fulton street) and Orleans street 80 feet wide.

Market street to be extended southeast 80 feet wide from Van Buren street to corner of Franklin and Harrison streets.

Market street: If river is straightened from 12th street or Harrison street, Market street will be changed south of Van Buren street to parallel the river to Harrison street. If river is straightened from Van Buren street south, Market street is extended south along the bank of the river to Archer avenue.

Franklin street: If river is straightened south of 12th street, Franklin street is to be extended south as a river road as far as Taylor street. If river is straightened south from Harrison street or Van Buren street, Franklin street is to be extended south to Archer avenue, 80 feet in width.

Fifth avenue to be opened 80 feet wide south of Archer avenue if position of river is changed at all.

Wentworth avenue to be extended north to Taylor street 80 feet wide.

Note: Improvement in street system east of Clark street is dependent on the future development of those areas.

Clinton street to be widened to 80 feet between Harrison and 12th streets.

Jefferson street to be widened to 80 feet between Harrison and 12th streets.

Sixty-foot intermediate streets to serve docks along river to be opened from Franklin street to Market street in Plan III, and from Fifth avenue to Franklin street in Plans II-A and II-B.

River road along west bank of the south branch of the Chicago River from Fulton and Canal streets to South Canal near 20th street: 60 feet wide north of Harrison street; 80 feet wide south of Harrison street. On plans I, II-A and II-B the river road is double decked between Harrison and 12th streets.

Canalport avenue to be extended 80 feet wide from Canal street to a junction with 16th street at west bank of the river on Plans I, II-A and II-B.

TABLE 1.

DATA ON STRAIGHTENING OF THE SOUTH BRANCH OF THE CHICAGO RIVER.

Item.	River straightened between 12th and 16th Sts.	River straightened between Harrison and 18th Sts.	River straightened between Van Buren and 21st Sts.
1 Distance river is shortened	500 ft.	600 ft.	1,070 ft.
2 Area reclaimed*	100,000 sq. ft.	120,000 sq. ft.	214,000 sq. ft.
3 Value of reclaimed area at $7.50 per sq. ft.	$750,000	$900,000	$1,605,000
4 Area transferred to east side of river	1,115,000 sq. ft.	3,200,000 sq. ft.	5,830,000 sq. ft.
5 Increase in value at an increment of $2.50 per sq. ft.	$2,792,500	$8,000,000	$14,575,000
6 At $5 per sq. ft.	$5,585,000	$16,000,000	$29,150,000
7 At $10 per sq. ft.	$11,115,000	$32,000,000	$58,300,000
Total gain, sum of Nos. 3 and 5	$3,542,500	$8,900,000	$16,180,000
Or—			
All values at $15 per sq. ft.	$12,615,000	$33,800,000	$61,510,000

*New area not before available.

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TABLE 2.

STREET VEHICLE TRAFFIC COUNTS—VICINITY OF RAILROAD TERMINALS, CENTRAL DISTRICT, CHICAGO.

STREET INTERSECTION	Street Width (Feet)	OBSERVATION		Number Vehicles Average Hour	Ratio Horse to Motor Vehicles	MAXIMUM HOUR		
		Month 1913	Period (Hours)			Time	Number of Vehicles	To and From Railroads direct(%)
14th St.—Clark St.	40, 80	June†	8	152	3	2:30- 3:30 p.m.	171	.....
13th St.—State St.	50, 100	June†	8	224	6	9:00-10:00 a.m.	356	.....
.....	.....	.....	.....	.....	.....	1:30- 2:30 p.m.	354	.....
12th St.—Indiana Ave.	30, 33	June†	8	205	3	9:00-10:00 p.m.	369	.....
Taylor St.—Fifth Ave.	40, 60	Sept.	1-1/3	286	7	10:00-11:00 a.m.	286	36
.....	.....	June†	8	282	10	3:30- 4:30 p.m.	376	.....
Taylor St.—Clark St.	40, 80	Oct.	4	438	9	3:30- 4:30 p.m.	569	68
Taylor St.—Plymouth Pl.	40, 50	Sept.	2	287	24	3:20- 4:20 p.m.	319	49
Polk St.—Ellsworth St.	40, 50	March†	11	117	5	2:00- 3:00 p.m.	156	.....
Polk St.—Sherman St.	40, 40	Sept.	½	468	33	11:00-12:00 a.m.	468	23
.....	.....	June†	8	398	23	10:00-11:00 a.m.	524	.....
Polk St.—La Salle St.	40, 40	Sept.	2½	606	24	10:00-11:00 a.m.	616	28
.....	.....	June†	8	424	29	1:30- 2:30 p.m.	679	.....
Harrison St.—Franklin St.	66, 80	Sept.	3	621	19	11:00-12:00 a.m.	717	38
Harrison St.—Fifth Ave.	60, 80	Sept.	2	711	11	2:00- 3:00 p.m.	760	.....
Canal St.—Harrison to Van Buren Sts.	80	March†	11	196	11	3:00- 4:00 p.m.	296	.....
Van Buren St.—Canal St. to River	66	March†	11	335	16	4:00- 5:00 p.m.	441	.....
Jackson Blvd.—Canal St. to Market St.	66	March†	11	587	0.5	4:00- 5:00 p.m.	702	.....
Canal St.—Madison St. to Washington St.	80	March†	11	206	26	4:00- 5:00 p.m.	297	.....
Madison St.—Market St.	80, 140	June†	8	704	4	8:00- 9:00 a.m.	928	.....
Lake St.—Market St. to Bridge	80	March†	11	273	12	9:00-10:00 a.m.	378	.....
So. Water St.—Beaubien St.	66, 50	Sept.	6	585	18	3:30- 4:30 p.m.	680	99
	66, 50	June†	8	528	14	3:30- 4:30 p.m.	660	.....
Michigan Ave.—River St.	66, 66	Sept.	2-1/3	1186	0.4	4:48- 5:48 p.m.	1302	9
Kinzie St.—Dearborn St.	80, 80	Sept.	1½	506	5	4:50- 5:50 p.m.	540	18

Note.—Counts made Sept. and Oct., 1913; various hours. Counts marked (†) made by Chicago Bureau of Streets, March, 1913, 11 hours, 7:00 a. m.–6:00 p. m.; June, 1913, 8 hours, 8:00 a. m.–12:00 m., and 12:30 p. m.–4:30 p. m.

The width of streets, as shown, is between building lines.

The ratio of horse to motor vehicles is based upon the totals for the period observed, not for the maximum hour.

TABLE 3.

CHICAGO STREET TRAFFIC.

VARIATIONS IN PROPORTIONS OF TEAMS AND MOTORS

1907, 1913.

Observed for 12-Hour Periods—6 A. M. to 6 P. M.

	East and West Streets Between Clark and Dearborn				North and South Streets Between Monroe and Adams							Average Increase 6 years
	Van Buren	Adams	Monroe	Madison	State	Dearborn	Clark	La Salle	Fifth	Franklin	Market	
1907												
Team	1,971	1,436	1,711	1,710	5,579	2,887	2,057	4,454	.....	2,252	.....	
Motor	47	80	281	208	333	67	36	182	.....	32	.....	
Total	2,018	1,516	1,992	1,918	5,912	2,954	2,093	4,636	.....	2,284	.....	
1913												
Team	1,888	1,571	1,472	1,779	3,002	1,812	2,336	2,564	1,454	2,493	2,000	
Motor	304	665	913	1,059	1,106	861	803	1,610	294	431	339	
Total	2,192	2,236	2,385	2,838	4,108	2,673	3,139	4,174	1,748	2,924	2,339	
Ratio 1913 to 1907												
Team increase	* 83	135	* 239	69	*2,577	*1,075	279	*1,890	.....	241	.....	
Team increase %	* 4.2	9.4	* 14.0	4.0	* 46.2	* 37.3	13.6	42.4	.....	10.7	.....	* 11.8
Motor increase	257	585	632	851	773	794	767	1,428	.....	399	.....	
Motor increase %	547.0	732.0	225.0	409.0	232.0	1,185.0	2,130.0	785.0	.....	1,246.0	.....	832.0
Total increase	174	720	393	920	*1,804	* 281	1,046	* 462	.....	640	.....	
Total increase %	8.6	47.5	19.7	48.0	* 30.5	* 9.5	50.0	* 10.0	.....	28.0	.....	19.1

Authority: Citizens' Street Cleaning Bureau.

*Decrease.

TABLE 4.

COMPOSITE RUSH HOUR TRAIN TRAFFIC.

Chicago Passenger Terminals.

STATION	Tracks			Trains		Trains per Day		Trains per Busy Hour	
	Station	Approach	Ratio	Per Day	Per Busy Hour	Per Station Track	Per Approach Track	Per Station Track	Per Approach Track
C. & N. W.	16	6	2.67	319	46	19.7	53.2	2.88	7.67
Union	12	4	3.0	278	37	23.2	66.3	3.08	9.25
La Salle	11	4	2.75	196	22	17.8	49.0	2.00	5.5
B. & O.	6	2	3.0	31	4	5.2	15.5	.67	2.00
Dearborn	9	2	4.5	154	19	17.1	77.0	2.11	9.50
I. C. (12th St.)	7	2	3.50	89	9	12.7	44.5	1.28	4.50
Total	61	20	3.05	1067	137	17.46	53.3	2.25	6.85
I. C. Suburban (Randolph St.)	6	2	3.0	284	34	42.7	128	5.1	15.5
Grand Total	67	22	3.05	1351	171	20.15	61.4	2.55	7.77

Note.—Records compiled from station train sheets. Busy hour of each individual station taken without reference to other stations. These periods overlap in some cases. The total represents the maximum station business for a composite rush or busy hour.

TABLE 5.

DAILY PASSENGER TRAIN MOVEMENT

Chicago Passenger Stations

Stations and Roads.	Through			Suburban			Grand
Union—	In.	Out.	Total.	In.	Out.	Total.	Total.
C. B. & Q.	15	16	31	33	30	63	94
P. C. C. & St. L.	10	10	20	..	..	..	20
P. Ft. W. & C.	18	20	38	10	6	16	54
C. & A.	11	11	22	..	..	..	22
C. M. & St. P.	27	31	58	17	16	33	91
Total	81	88	169	60	52	112	281
Grand Central—							
B. & O.	7	7	14	2	2	4	18
C. G. W.	4	4	8	..	..	..	8
P. M.	6	6	12	..	..	..	12
Total	17	17	34	2	2	4	38
C. & N. W.—							
Total	60	61	121	96	93	189	310
La Salle—							
L. S. & M. S.	17	20	37	18	18	36	73
C. R. I. & P.	16	15	31	38	37	75	106
C. I. & S.	3	3	6	..	..	..	6
N. Y. C. & St. L.	3	3	6	..	..	..	6
Total	39	41	80	56	55	111	191
Dearborn—							
A. T. & S. F.	7	8	15	..	..	..	15
C. & W. Ind.	..	..	..	11	11	22	22
G. T.	7	6	13	4	4	8	21
C. & O.	3	3	6	..	..	..	6
C. & E. I.	12	11	23	2	3	5	28
Monon	8	8	16	..	..	..	16
Erie	7	5	12	..	..	..	12
Wabash	10	9	19	3	4	7	26
Total	54	50	104	20	22	42	146
Illinois Central—							
I. C.	17	17	34	143	145	288	322
Soo Line	7	7	14	..	..	..	14
M. C.	15	14	29	..	..	..	29
C. C. C. & St. L.	4	4	8	..	..	..	8
Total	43	42	85	143	145	288	373
Grand total	294	299	593	377	369	746	1339

Note.—Tables 5 to 10, inclusive, present actual returns from the various railroads as representing average traffic conditions for week days only. Verification of detailed returns is necessary to eliminate obvious inconsistencies.

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TABLE 6.

DAILY PASSENGER CAR MOVEMENT

Chicago Passenger Stations

Stations and Roads.	Through			Suburban			Grand
Union—	In.	Out.	Total.	In.	Out.	Total.	Total.
C. B. & Q.	130	123	253	155	146	301	554
P. C. C. & St. L.	65	65	130	..	..	..	130
P. Ft. W. & C.	119	115	234	32	19	51	285
C. & A.	74	75	149	..	..	..	149
C. M. & St. P.	205	239	444	60	53	113	557
Total	593	617	1210	247	218	465	1675
Grand Central—							
B. & O.	40	40	80	7	6	13	93
C. G. W.	26	26	52	..	..	..	52
P. M.	37	37	74	..	..	..	74
Total	103	103	206	7	6	13	219
C. & N. W.	394	391	785	424	421	845	1630
La Salle—							
L. S. & M. S.	139	138	277	88	89	177	454
C. R. I. & P.	101	104	205	174	166	340	545
C. I. & S.	10	10	20	..	..	..	20
N. Y. C. & St. L.	23	22	45	..	..	..	45
Total	273	274	547	262	225	517	1064
Dearborn—							
A. T. & S. F.	47	50	97	..	..	..	97
C. & W. Ind.	..	..	..	31	29	60	60
G. T.	42	43	85	22	24	46	131
C. & O.	10	10	20	..	..	..	20
C. & E. I.	78	77	155	6	12	18	173
Monon	39	41	80	..	..	..	80
Erie	38	31	69	..	..	..	69
Wabash	52	51	103	10	10	20	123
Total	306	303	609	69	75	144	753
Illinois Central—							
I. C.	113	111	224	626	619	1245	1469
Soo Line	41	41	82	..	..	..	82
M. C.	117	114	231	..	..	..	231
C. C. C. & St. L.	26	27	53	..	..	..	53
Total	297	293	590	626	619	1245	1835
Grand total	1966	1981	3947	1635	1594	3229	7176

TABLE 7.

DAILY PASSENGER MOVEMENT

Chicago Passenger Stations

Stations and Roads.	Through			Suburban			Grand
Union—	In.	Out.	Total.	In.	Out.	Total.	Total.
C. B. & Q.	2195	2200	4395	7120	5140	12260	16655
P. C. C. & St. L.†	934	1218	2152	..	..	..	2152
P. Ft. W. & C.†	1329	1482	2811	498	303	801	3612
C. & A.	1227	1404	2631	..	..	..	2631
C. M. & St. P.	3568	3588	7156	1644	1618	3262	10418
Total	9253	9892	19145	9262	7061	16323	35468
Grand Central—							
B. & O.	340	310	650	210	260	470	1120
C. G. W.	185	306	491	..	..	..	491
P. M.	1141	893	2034	..	..	..	2034
Total	1666	1509	3175	210	260	470	3645
Total C. & N. W.	8300	8511	16811	17000	15583	32583	49394
La Salle—							
L. S. & M. S.	1909	2651	4560	4242	4052	8294	12854
C. R. I. & P.	2292	2160	4452	8160	8264	16424	20876
C. I. & S.	299	379	678	..	..	..	678
N. Y. C. & St. L.	368	326	694	..	..	..	694
Total	4868	5516	10384	12402	12316	24718	35102
Dearborn—							
A. T. & S. F.	1000*	1000*	2000*	..	..	..	2000
C. & W. I.	..	..	..	2699	2126	4825	4825
G. T.	631	635	1266	1172	1175	2347	3613
C. & O.	240	215	455	..	..	..	455
C. & E. I.	1750	1745	3495	300	400	700	4195
Monon	442	420	862	..	..	..	862
Erie	450*	450*	900	..	..	..	900
Wabash	560	430	990	185	280	465	1455
Total	5073	4895	9968	4356	3981	8337	18305
Ill. Central—							
I. C.	2365	2525	4890	20696	20061	40757	45647
Soo Line	410	404	814	..	..	..	814
M. C.	1507	1254	2761	..	..	..	2761
C. C. C. & St. L.	875	800	1675	..	..	..	1675
Total	5157	4983	10140	20696	20061	40757	50897
Grand total	34317	35306	69623	63926	59262	123188	192811

*Estimated.

†Understood to be based upon actual traffic counts. Totals for Union Station are considerably greater than observed during winter holidays, 1911 and 1912. Saturday only suburban trains not included.

TABLE 8.

SUMMARY OF RAILROAD PASSENGER TRAFFIC

Total Daily Train, Car and Passenger Movements.

Chicago Passenger Stations.

Stations.	Through			Suburban			Total Through and Suburban		
	Trains.	Cars.	Pass.	Trains.	Cars.	Pass.	Trains.	Cars.	Pass.
Union	169	1210	19145	112	465	16323	281	1675	35468
Grand Central	34	206	3175	4	13	470	38	219	3645
C. & N. W.	121	785	16811	189	845	32583	310	1630	49394
La Salle Street	80	547	10384	111	517	24718	191	1064	35102
Dearborn	104	609	9968	42	144	8337	146	753	18305
Ill. Central	85	590	10140	288	1245	40757	373	1835	50897
Grand Total	593	3947	69623	746	3229	123188	1339	7176	192811

TABLE 9.

AVERAGE CARS PER TRAIN.

Chicago Railroad Terminals.

	THROUGH			SUBURBAN			
	In	Out	Total	In	Out	Total	Total
Union	7.3	5.9	6.6	4.1	4.0	4.0	5.5
Grand Central	6.1	6.1	6.1	3.5	3.0	3.3	5.8
C. & N. W.	6.6	6.4	6.5	4.4	4.5	4.5	5.3
La Salle	6.4	6.7	6.6	4.7	4.6	4.7	5.5
Dearborn	5.9	6.0	5.9	3.3	3.3	3.3	5.2
I. C.	6.9	6.8	6.9	4.4	4.3	4.3	4.9
Total	6.7	6.3	6.5	4.3	4.2	4.3	5.4

TABLE 10.

AVERAGE PASSENGERS PER TRAIN.

Chicago Railroad Terminals.

STATIONS	THROUGH			SUBURBAN			Grand Average
	In	Out	Total	In	Out	Total	
Union	115.5	113.8	114.8	154.2	135.7	145.7	127.1
Grand Central	98.0	88.8	93.4	105.0	130.0	117.5	96.8
C. & N. W.	138.2	139.4	138.8	177.1	167.6	172.2	159.3
La Salle	124.9	134.5	129.8	221.4	224.0	222.3	183.2
Dearborn	94.0	97.9	95.8	217.8	180.9	198.3	125.3
I. C.	119.9	118.6	119.4	144.7	138.2	141.4	136.2
Average of total	117.0	118.4	117.8	168.2	158.4	165.1	144.1

TABLE 11.

BAGGAGE, MAIL AND EXPRESS HANDLED AT THE SEVERAL STATIONS.

STATIONS	Pieces of Baggage		Bags of Mail		Pounds of Express	
	Arriving	Departing	Arriving	Departing	Arriving	Departing
Union	3,124	3,669	13,108	30,756	950,950	800,700
N. W	2,361	2,526	3,519	6,567	350,050	331,310
La Salle	1,313	1,523	7,515	22,347	360,575	376,534
Dearborn	1,679	1,551	3,171	13,298	269,188	460,439
I. C	1,443	1,251	2,205	5,045	396,387	335,234
B. & O	1,243	533	1,243	2,481	150,980	178,900
Total	11,163	11,053	30,761	80,494	2,478,130	2,483,117

Note.—Data obtained from recent returns from railroads. In the case of three roads furnishing incomplete reports, missing items have been estimated based upon their proportion of cars moved. The mail returns present some inconsistencies with respect to Fig. 9 showing the tonnage reported by the Chicago Post Office for September, 1913. One station reported truck loads instead of bags handled, as estimated therefrom. United States Post Office reports mail business increasing with great rapidity, especially that of the parcel post which is today 80 or 90 per cent higher than one year ago.

TABLE 12.

GENERAL SUMMARY OF L. C. L. FREIGHT TONNAGE

ALL PACKAGE FREIGHT HANDLED WITHIN THE CITY

Group.	No. of Houses.	Inbound tonnage Total inbound.	For Chicago delivery.	Sent to other roads.	Outbound tonnage Total outbound.	Originating in Chicago.	Received from other roads.	Total.	Chicago Business.
A—East of river	29	4815	3099	1716	5467	2653	2814	10282	5752
B—West of river	16	1174	862	312	2116	1173	943	3290	2035
C—North and N. W. of river	17	1833	708	1125	5087	2620	2467	6920	3328
D—Lake front	9	2108	762	1346	3189	2048	1141	5297	3289
*Total	71	9930	5910	4699	15859	8494	7365	25789	14404

Note: This table shows the tonnage handled in all L. C. L. freight houses within the City, including not only the downtown district but also outlying and transfer houses. It is compiled directly from railroad data and while the total outbound business is believed to be reasonably accurate, there are apparent inconsistencies in the returns covering transfer freight; for the total "sent to other roads" and "received from other roads" should balance as in diagram Fig. 90, which graphically shows this condition. A possible explanation for this discrepancy between transfer inbound and outbound is that a large amount of freight handled by cars is transferred at outlying transfer houses directly without reaching the downtown district and has not been reported as business of inbound houses.

TABLE 13.

COMPARATIVE HOUSE AND TEAM TRACK BUSINESS.

Summarized by Groups—Downtown District Only.

	Group A	Group B	Group C	Group D	
	East of River	West of River	North and North-West of River	Lake Front	Total
Car Standing Capacity:					
Freight House	1,253	798	537	475	3,063
Team Tracks	953	1,416	916	750	4,035
Total	2,206	2,214	1,453	1,225	7,098
Cars Moved Per Day:					
Freight House	1,426	545	700	607	3,278
Per Cent Cars Moved to Standing	113.7	68.3	130.3	127.9	107.0
Team Tracks	236	210	242	122	810
Per Cent Cars Moved to Standing	24.8	14.8	26.4	16.2	20.1
Total Cars Moved	1,662	755	942	729	4,088
Tons Handled Per Day:					
Freight House	9,602	3,764	3,852	3,840	21,058
Team Tracks	5,154	3,821	5,599	2,224	16,798
Total Tonnage Handled	14,756	7,585	9,451	6,064	37,856
Relative Tonnage Handled:					
Per cent by Groups	39	20	25	16	100
Average Tons per Car:					
Freight House	6.73	6.91	5.50	6.33	6.43
Team Track	21.85	18.19	23.12	18.22	20.72
Per Cent House Cars to Total	85.8	72.2	74.3	83.3	80.2
Per Cent House Tons to Total	61.6	49.6	40.8	63.4	55.8
Per Cent House Standing Car Capacity to Total	55.5	36.0	37.0	38.8	43.2

Note.—This record, and that of Tables 14 and 15, is compiled directly from data furnished by the individual railroads without any attempt at detailed verification, which ought to be made in order to eliminate obvious inconsistencies. However, while these inconsistencies might be relatively important in the individual returns, it is believed that the total results by groups of railroads, as herein presented, are reasonably representative of present conditions.

TABLE 14.

COMPARATIVE USAGE OF FREIGHT HOUSE AREAS.

Inbound, Outbound and Combined Houses, by Groups.

Downtown District only.

	Group A. East of River.	Group B. West of River.	Group C. N. & N. W. of River.	Group D. Lake Front.	TOTAL.
Inbound					
Ground Floor area of freight houses in square feet	331,934	248,462	229,138	148,300	958,634
Total area of houses and tracks in square feet.	510,434	349,962	301,938	182,800	1,345,134
Total car standing capacity	357	203	144	69	773
Average tons per day	3,149	1,350	1,576	1,185	7,260
Cars moved per day	413	158	294	185	1,050
Per cent. cars moved to standing	115.6	77.9	204.0	268.0	136.0
Total area per standing car in square feet	1,429	1,725	2,097	2,653	1,740
Average area of platform per ton per day in square feet	105.2	184.0	146.1	125.1	132.1
Outbound					
Ground floor area of freight houses in square feet	243,367	314,521	215,074	78,698	851,660
Total area of houses and tracks in square feet.	557,867	612,021	407,574	251,698	1,829,160
Total car standing capacity	629	595	385	346	1,955
Average tons per day	3,797	2.414	2,214	2,212	10,637
Cars moved per day	588	387	399	340	1,714
Per cent. cars moved to standing	93.5	65.0	103.7	98.4	87.8
Total area per standing car in square feet	887	1,028	10,575	727.5	936.0
Average area of platform per ton per day in square feet	64.1	130.2	97.1	35.6	80.0

Combined Houses					
Ground floor area of freight houses in square feet	134,060	.....	22,750	13,680	170,490
Total area of houses and tracks in square feet	267,560	.....	26,750	43,680	337,990
Total car standing capacity	267	.....	8	60	335
Average tons per day	2,656	.....	62	443	3,161
Daily inbound cars	233	.....	3	28	264
Daily outbound cars	192	.....	4	54	250
Total daily cars	425	.....	7	82	514
Total area per standing car in square feet	1,002.5	.....	3,344	724	1,008
Per cent. cars moved to standing	163.4	.....	87.5	136.5	153.4
Average area of platform per ton per day in square feet	50.6	.....	367.0	30.8	53.9
Summary					
Ground floor area of freight houses in square feet	709,361	562,983	467,762	240,678	1,980,784
Total area of houses and tracks in square feet	1,335,861	961,983	736,262	478,178	3,512,304
Total car standing capacity	1.253	798	537	475	3,063
Average tons per day					
Inbound	4,715	1,350	1,606	1,343	9,014
Outbound	4,887	2,414	2,246	2,497	12,044
Total	9,602	3,764	3,852	3,840	21,058
Cars moved per day					
Inbound	646	158	297	213	1,314
Outbound	780	387	403	394	1,964
Total	1,426	545	700	607	3,278
Total area per standing car in square feet	1,064	1,205	1,370	1,006	1,146
Per cent. cars moved to standing	113.7	68.4	130.1	127.7	107.0
Average area of platform per ton per day in square feet	73.8	149.6	121.3	62.8	94.0

TABLE 15.

COMPARATIVE USAGE OF TEAM TRACK AREAS.

By Groups, Downtown District.

	Group A. East of River.	Group B. West of River.	Group C. N. & N. W. of River.	Group D. Lake Front.	Total
Area occupied in square feet	1,417,022	1,785,132	979,506	807,450	4,989,110
Car standing capacity	953	1,416	916	750	4,035
Area occupied per standing car in square feet	1,487	1,260	1,067	1,076	1,236
Cars handled per day:					
In-bound	148	153	184	83	568
Out-bound	88	57	58	39	242
Total	236	210	242	122	810
Per cent. outbound to total	37.3	27.1	23.9	32.0	29.9
Per cent. cars handled to standing	24.8	14.8	26.4	16.2	20.1
Tons handled per day:					
In-bound	3,414	2,912	4,458	1,500	12,284
Out-bound	1,740	909	1,141	724	4,514
Total	5,154	3,821	5,599	2,224	16,798
Average tons per car:					
In-bound	23.1	19.0	24.2	18.1	21.6
Out-bound	19.8	15.9	19.7	18.6	18.6
Total	21.8	18.2	23.1	18.2	20.7
Average area per ton per day, square feet	275	467	175	362	297

TABLE 16.

OCCUPATION OF RAILROAD PROPERTY (PLATE IV.)

Chicago Central District.

Section of Property Occupied	Areas in Square Feet. Unused (Red)	Partly Used (Red Line)	Fully* Used (Blue)	Private Occupancy (Yellow)	Grand Totals
1. New Pennsylvania Areas: (a) Proposed Freight Terminal between 14th and Van Buren on Jefferson Street ..... (b) Proposed Passenger Station, Jackson to Adams on Clinton Street. Total	367,200	.....	.....	543,600	910,800
2. 16th Section, Canal Street west to Halsted, and between 12th and 16th Streets	.....	.....	1,249,200	.....	1,249,200
3. West Side group, Canal Street east to the river, and 20th Street north to Fulton	1,076,400	1,857,600	3,225,600	468,000	6,627,600
4. Northwestern Section, West of Canal, north of Madison, and north and east of the river, to the Lake	436,800	190,800	3,787,200	18,000	4,432,800
5. Illinois Central Section, Lake Front, from the river, south to 22nd Street	511,200	2,271,600	3,639,000	86,400	6,508,200
6. East Side group, east of the river, incl. St. Charles Air Line to Indiana Avenue	597,600	1,555,200	4,230,000	421,200	6,804,000
Totals. Square feet	2,989,200	5,875,200	16,131,000	1,537,200	26,532,600
Acres	68.62	134.88	370.32	35.29	609.11
Percentage	11	22	61	6	100%

NOTE.—These areas are included within the district bounded by 22nd Street, Halsted Street, Chicago Avenue, and the Lake Front, which is approximately 15,800 feet from north to south, and 6,800 feet from west to the east edge of Grant Park, an area of 107,500,000 square feet, or 2,470 acres, of which the total railroad property is about 25%.

*Fully used on the basis of present single deck freight house construction.

TABLE 17.

COMPARATIVE FREIGHT FACILITIES WEST OF THE RIVER.
Present and Proposed.

	Platform Area. (Sq. Ft.)	House Car Capacity	Team Track Car Capacity
Facilities of the West Side roads South of Washington St. between Canal St. and the river....	427,832	586 (460)	1,094 (155)
The above plus occupancy of same roads East of river.....	527,887	773 (636)	1,094 (155)
Existing facilities displaced by proposed union station ordinance.....	150,855	307 (200)	53 (20)
Facilities offered by proposed P. R. R. freight terminal at Van Buren and Jefferson Sts.....	335,900	376	181
Total facilities available between Canal St. and the river if proposed union station is built....	276,977	279 (260)	1,041 (135)
Facilities offered by plans shown in this report:			
Plate I.....	917,000	1,490	867
Plate II-A.....	482,800	816	456
Plate II-B.....	968,000	1,671	556
Plate III.....	632,000	784	364

Note.—Figures in parenthesis show cars handled per day at present, indicating the utilization of present facilities.

TABLE 18.

CHICAGO RIVER BRIDGE OPENINGS.

City Bridge Department and U. S. Engineers' Office.

BRIDGE	To East End U. S. North Pier, Miles	CLEAR SPACE		TIME OPEN		SWINGS				Per Cent Time Open in 24 Hours
		Horizontal Feet	Vertical Feet	Per Day Minutes	Per Swing Minutes	Total per Day	Average per Hour	Maximum		
								Per Hour	Hour	
Main Branch										
Rush	.87	145.0	17.5	57.3	2.37	24.2	1.01	2.13	9–10 A.M.	.398
				80.9	2.76	29.3				
State	1.07	140.0	16.5	67.3	2.84	23.7	.98	1.46	10–11 A.M.	.461
				101.4	3.51	28.9				
Dearborn	1.15	140.0	17.3	56.3	3.13	18.0	.75	1.73	7–8 P.M.	.391
				81.5	3.31	24.6				
Clark	1.23	134.8	17.5	41.6	2.28	18.2	.76	2.06	7–8 P.M.	.289
				59.2	2.43	24.4				
Wells	1.35	136.2	17.5	58.0	3.12	18.6	.77	2.40	7–8 P.M.	.402
				85.8	3.55	24.2				
North Branch										
C.& N.W.	1.76	100.0	5.0							
Kinzie	1.79	90.0	11.0	71.7	3.03	23.6	.98			.498
				101.6	3.05	33.2				
C.M.& St.P.	1.84	99.0	5.0							
South Branch										
Lake	1.62	133.4	18.7	33.3	2.94	11.3	.47	1.00	7–8 P.M.	.231
				49.6	3.51	14.1				
Randolph	1.71	144.7	16.7	41.3	3.25	12.7	.53	1.20	10–11 A.M.	.287
Washington	1.79	170.0	16.6	32.6	3.03	10.8	.45	1.55	10–11 A.M.	.227
				43.5	3.12	13.9			7–8 P.M.	
Madison	1.91	107.0	18.2	30.6	3.01	10.2	.42	1.13	10–11 A.M.	.213
				45.0	3.21	14.0				
Adams	2.06	77.0	21.8	29.0	2.92	9.9	.41	1.13	7–8 P.M.	.201
				33.3	3.11	10.7				
Jackson	2.15	90.6	22.0	22.0	2.20	10.0	.41	1.13	7–8 P.M.	.153
				31.0	2.59	12.0				
M. W. S. L.	2.18	91.8	34.1							
Van Buren	2.24	93.5	16.5	37.3	3.18	11.7	.56	1.20	7–8 P.M.	.257
				45.3	3.21	14.1				
Harrison	2.41	140.0	16.5	58.6	2.98	19.6	.82	2.07	9–10 A.M.	.407
				55.9	3.10	18.0				
Polk St	2.58	140.0	16.5	33.6	3.42	9.8	.41	1.27	10–11 A.M.	.234
				38.0	3.05	12.4				
Taylor	2.74	144.4	24.0	29.3	2.95	9.9	.41	1.07	9–10 A.M.	.203
				39.2	3.00	13.0				
B.& O.C.T.	2.81	120.2	4.7							
12th	2.91	61.3	22.0	42.6	4.32	9.8	.41	1.00	9–10 A.M.	.296
				56.7	4.82	11.7			10–11 A.M.	
St.C. Air L.	3.46	110.0	14.6	87.0	3.50	25.0	1.04			.604
18th	3.68	140.0	20.7	32.9	3.41	9.6	.40			.228
				44.9	3.75	12.0				
Penna	3.86	67.2	7.7	275.0	7.00	39.0	1.62			1.910
Canal	3.96	140.0	16.5	39.2	2.26	17.3	.72			.272
				56.9	4.01	14.2				

Note.—The first line of figures opposite each bridge is for the period June 1 to June 15, 1913; the second line wherever it appears is for the period September 1 to September 15, 1913.

TABLE 19.

PRESENT COACH YARDS LOCATION AND NECESSARY BACK HAUL.

ROAD	LOCATION OF COACH YARD	Miles back haul
A. T. & S. F.	18th Street	1 mile
B. & O.	12th Street and river	$\frac{1}{2}$ "
B. & O. C. T.	Taylor Street and 5th Avenue	$\frac{1}{2}$ "
C. B. & Q.	14th and Stewart	1 "
C. G. W.	12th and river	$\frac{1}{2}$ "
C. I. & S.	43rd Street	$4\frac{1}{2}$ "
C. I. & L.	51st and Stewart	$5\frac{1}{4}$ "
C. M. & St. P.	Western Avenue	$3\frac{3}{4}$ "
C. R. I. & P.	51st and La Salle	$4\frac{3}{4}$ "
C. & A.	37th and California	$5\frac{1}{2}$ "
C. & E. I.	51st and Stewart	$5\frac{1}{4}$ "
C. & N. W.	California and Kinzie	3 "
	Erie and Halsted	$2\frac{1}{2}$ "
C. & O.	51st and Stewart	$5\frac{1}{4}$ "
C. & W. I.	51st and Stewart	$5\frac{1}{4}$ "
C. C. C. & St. L.	16th and Lake Michigan	$\frac{3}{4}$ "
Erie	51st and Stewart	$5\frac{1}{4}$ "
G. T.	51st and Stewart	$5\frac{1}{4}$ "
I. C.	16th and Lake Michigan	$\frac{3}{4}$ "
L. S. & M. S.	43rd Street	$4\frac{1}{2}$ "
M. C.	16th and Lake Michigan	$\frac{3}{4}$ "
M. St. P. & S. S. M.	16th and Lake Michigan	$\frac{3}{4}$ "
N. Y. C. & St. L.	Stoney Island Yard	$10\frac{1}{2}$ "
P. M.	12th and river	$\frac{1}{2}$ "
P. C. C. & St. L.	12th and Stewart	1 "
P. Ft. W. & C.	12th and Stewart	1 "
Wabash	51st and Stewart	$5\frac{1}{4}$ "

TABLE 20.

DISTANCE FROM ELEVATED STATIONS AND BUSINESS CENTER (DEARBORN AND MADISON STREETS) TO PRESENT CHICAGO TERMINALS.

STATION	Distance Main Entrance to Nearest Elevated Loop Station, Feet	Distance Main Entrance to Nearest Elevated Station, Feet	Distance to Dearborn and Madison Streets, Feet	Distance Main Station Entrance to Middle of Train, Feet
C.& N. W.	1,800	1,500	3,000	650
La Salle	100	100	2,700	650
B. & O.	1,400	1,200	4,000	600
Dearborn	1,700	1,700	3,500	450
I. C. 12th St.	4,400	1,300	6,600	500
Union (Present)	2,000	900	3,400	450
I.C.RandolphSt.	1,100	1,100	2,400	400
I.C.Van Buren.	1,250	1,200	3,450	250

TABLE 21.

ANNUAL TRAFFIC STATISTICS OF AMERICAN RAILROADS.

Year	Population U. S. A. (Millions)	Passengers Carried. (Millions)	Tons Carried. (Millions).	Rides per Capita.	Tons per Capita.
1860	31.4	60	70	1.92	2.23
1870	38.6	110	150	2.85	3.88
1880	50.2	....	....	.....	.....
1881	51.4	....	....	.....	.....
1882	52.7	289	360	5.48	6.83
1883	54.0	313	400	5.79	7.41
1884	55.3	335	399	6.05	7.22
1885	56.6	351	437	6.20	7.71
1886	57.8	382	482	6.61	8.34
1887	59.1	428	552	7.24	9.34
1888	60.4	451	591	7.46	9.78
1889	61.7	495	619	8.03	10.01
1890	62.9	520	701	8.28	11.15
1891	64.2	....	....	.....	.....
1892	65.5	576	731	8.79	11.15
1893	66.9	597	757	8.94	11.30
1894	68.1	570	675	8.37	9.91
1895	69.3	530	756	7.65	10.90
1896	70.6	535	774	7.58	10.95
1897	72.0	504	788	7.00	10.95
1898	73.2	515	913	7.03	12.47
1899	74.6	538	975	7.22	13.07
1900	76.0	585	1071	7.70	14.10
1901	77.5	600	1084	7.75	13.98
1902	79.1	655	1192	8.27	15.38
1903	80.7	697	1300	8.65	16.12
1904	82.3	719	1273	8.74	15.50
1905	83.8	745	1435	8.89	17.12
1906	85.5	816	1610	9.54	18.82
1907	87.0	861	1722	9.89	19.80
1908	88.5	891	1521	10.07	17.20
1909	89.0	924	1635	10.38	18.38
1910	92.0	999	1818	10.87	19.77
1911	93.7	1020	1818	10.88	19.40
1912	....	....	....	.....	.....

Note.—Compiled from U. S. Census Reports, Poor's Manual of American Railroads and Mulhall's Dictionary of Statistics. The total traffic reported does not entirely agree with that of the Interstate Commerce Commission Reports, but appears to be consistent as to general growth.

TABLE 22.

COMPARATIVE RAILROAD STATISTICS, UNITED STATES AND NORTH CENTRAL STATES.

Interstate Commerce Commission, 1910.

	Entire U. S.	North Central States. Group VI.
Passengers carried	971,683,199	144,492,011
Passenger miles	32,338,496,329	5,889,883,921
Average passenger haul	33.50 miles	40.76 miles
Average revenue per passenger mile	1.938 cents	1.887 cent
Tons freight	1,849,900,101	332,455,754
Ton miles, freight	255,016,910,451	46,502,549,180
Receipts per ton mile	0.753 cents	0.751 cents
Average haul per ton	138.31 miles	140.66 miles
Ratio operating expense to operating revenue	66.29%	66.84%
Average receipts per passenger	66 cents	80 cents
Average receipts per ton	$1.04	$1.05

Note.—Group VI includes Illinois, Iowa, Wisconsin, Minnesota, the north peninsula of Michigan, and parts of North and South Dakota and Missouri. The table is presented to show the relation between the business done in this group and that of the entire country. Both sources are drawn upon for indicating tendencies in the probable future growth of railroad business in Chicago.

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General Railway Statistics.

The Bureau of Railway Statistics report for 1912 tells that 3,236,619 tons of commodities were daily handled by all railroads in the United States requiring the use of 177,813 cars.

87.3 per cent. of all cars were used for C. L. freight.
12.7 per cent. of all cars were used for L. C. L. freight.
95.7 per cent. of the total tonnage was in C. L. lots.
4.3 per cent. of the total tonnage was in L. C. L. freight.

Statistics available from reliable sources for Chicago show that 281,880 tons of commodities were handled by Chicago roads in one day during January, 1912, requiring 17,118 cars.

75 per cent. of all cars were used for C. L. freight.
25 per cent. of all cars were used for L. C. L. freight.
90.8 per cent. of the total tonnage was in C. L. lots.
9.2 per cent. of the total tonnage was in L. C. L. freight.
8.6 per cent. of the entire railroad freight tonnage of the United States is being handled in Chicago.

Package freight business of Chicago amounts to 9.2 per cent. of total tonnage handled in Chicago, while the package freight business of the entire United States amounts to but 4.3 per cent. of the total tonnage.

This shows that the package freight business of Chicago, being 9.2 per cent., is double that of the general average (4.3 per cent.) for the entire United States. Thus proving that Chicago is probably the greatest commercial center in the country because of the preponderance of package freight shipments.

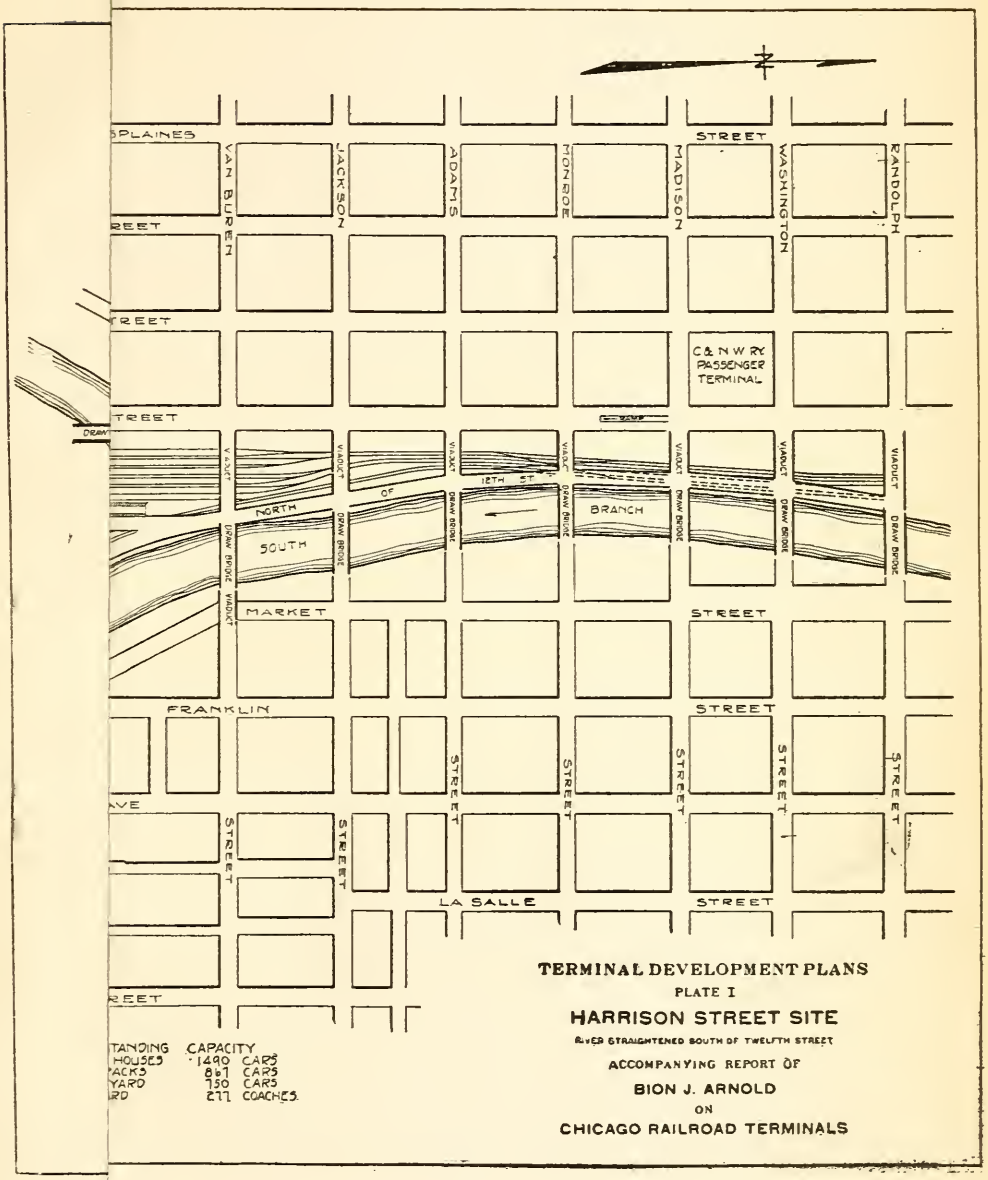
Year 1848.

Chicago had neither railroad nor telegraph.

Year 1912.

The mileage owned and operated by the roads entering Chicago was 83,063, not including distant mileage not directly connected with Chicago business.

The total mileage in operation in the United States was 250,000.



Street. Extensive coach and freight yard, team track and freight ho[illegible] tracks may be placed either beneath or at the same level as the ma[illegible]

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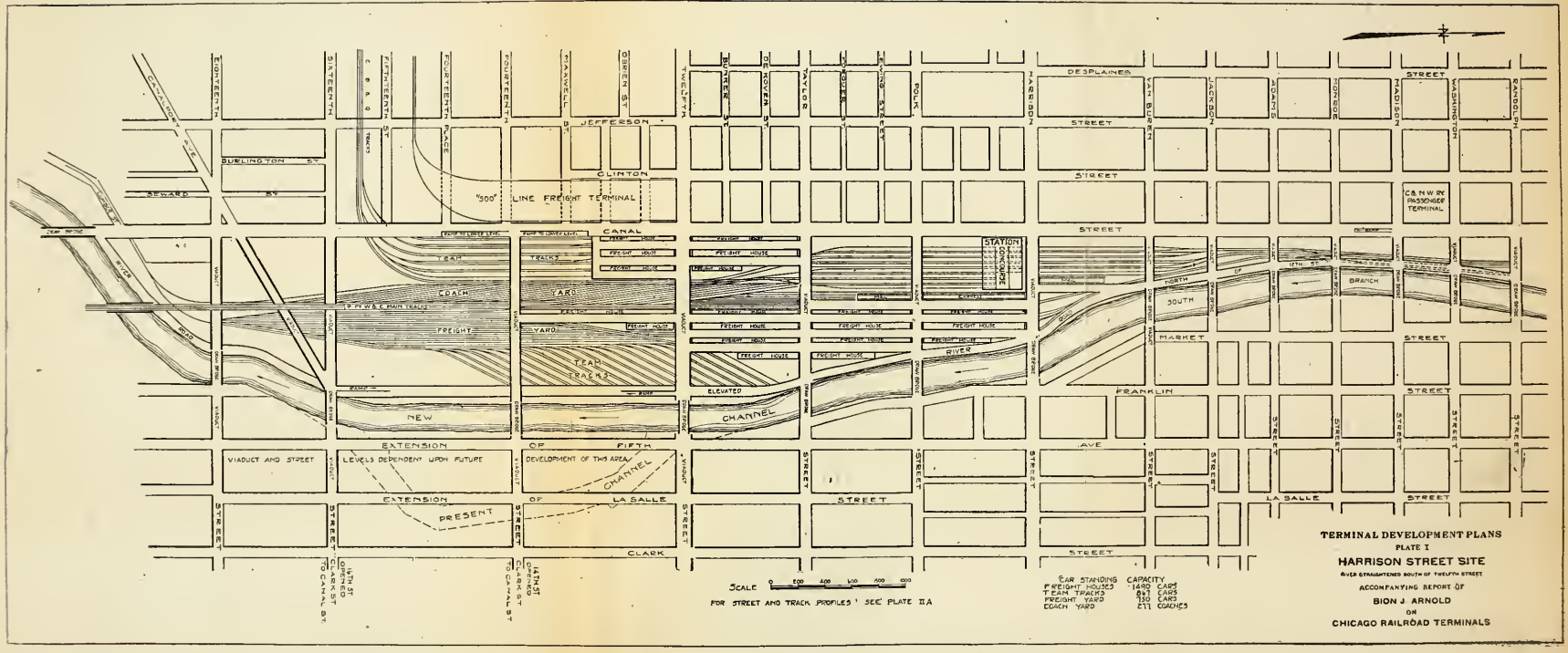

PLATE I. WEST SIDE UNION STATION SOUTH OF HARRISON STREET.

This plan shows a double stub station for the Union and Grand Central groups of roads at Harrison Street. The river is straightened south of 12th Street. Extensive coach and freight yard, team track and freight house facilities are provided, with second floor driveways. Several present streets are extended and widened and some new streets created. Suburban tracks may be placed either beneath or at the same level as the main tracks. Public markets, rail and water connections, docks and warehouses are provided for.

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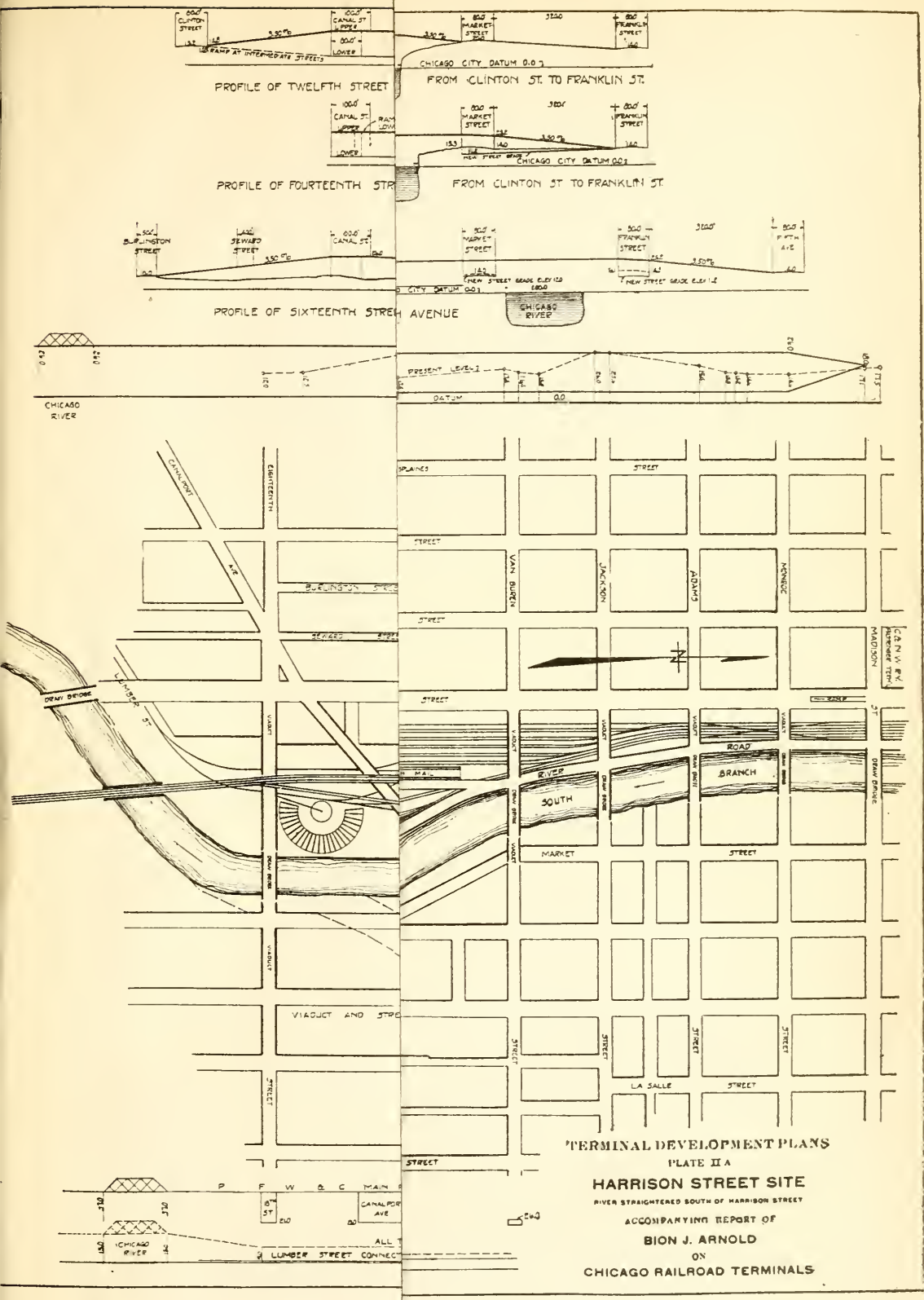


This alternative plan shows The river is straightened from Harrison Street south, and Market and Franklin St ises are provided for. Many streets are opened and widened. Canal Street is dou and dock facilities on both sides of the new channel. Suburban tracks may eith , as in Plate III.

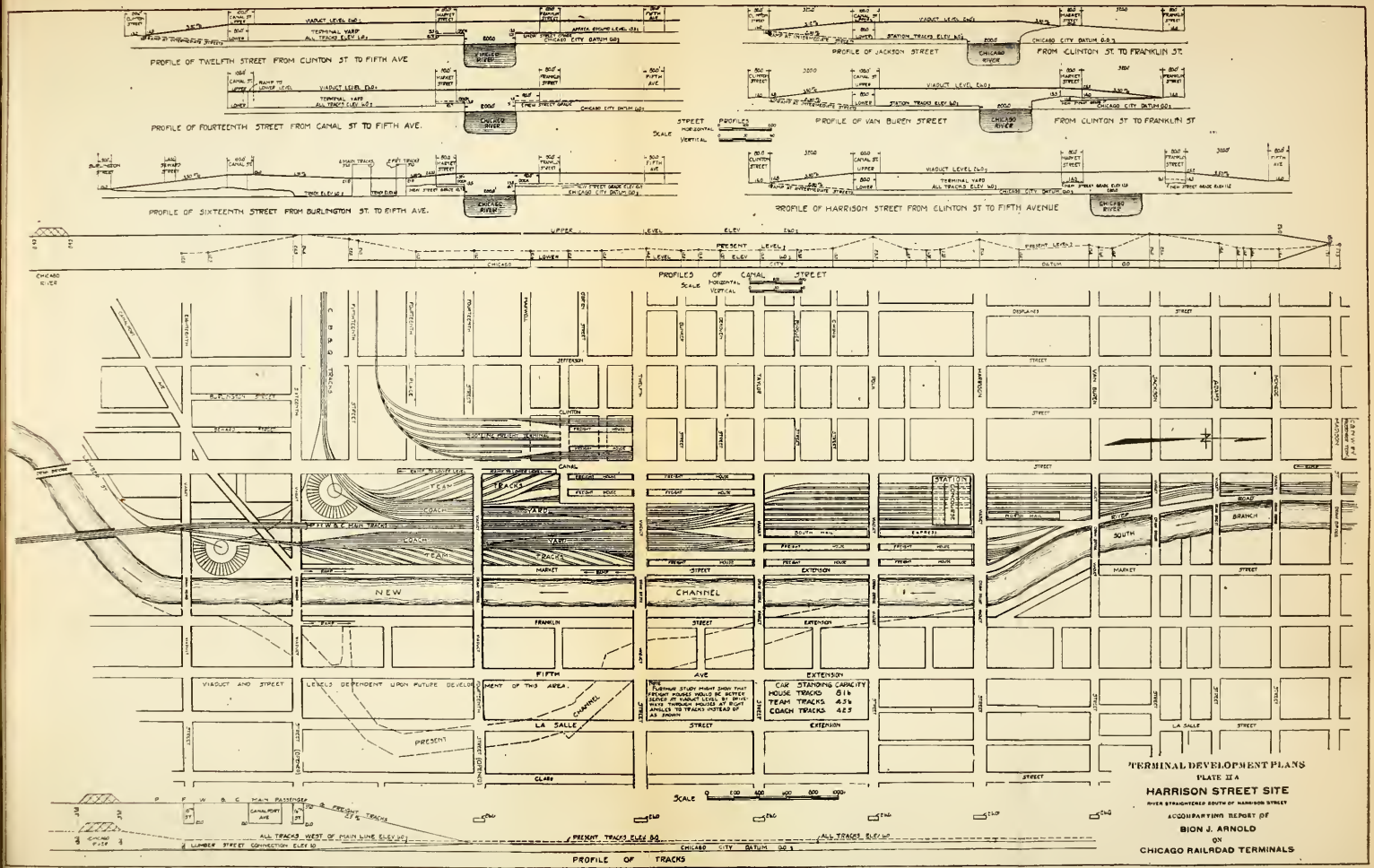
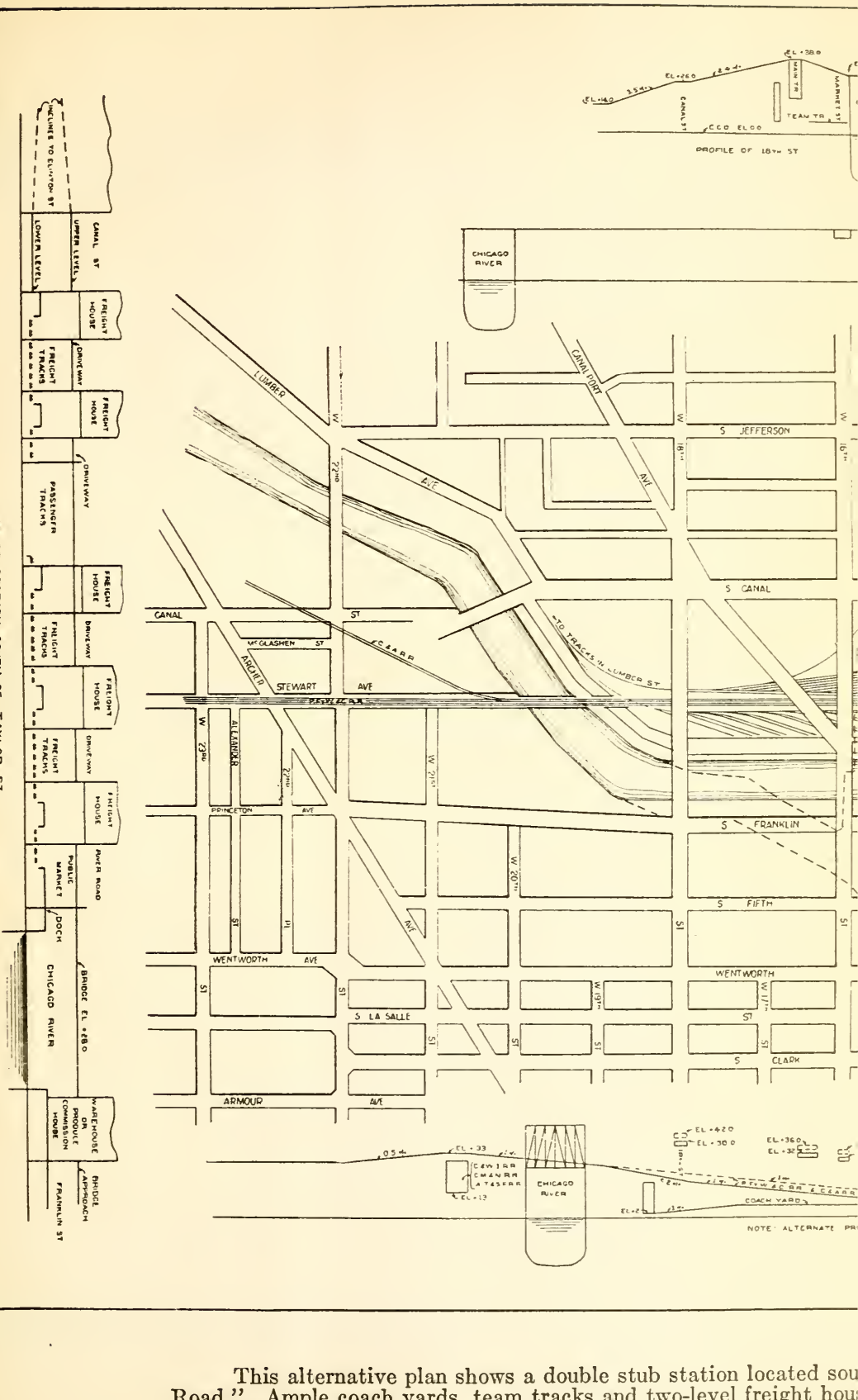

PROFILE OF TWELFTH STREET FROM CLINTON ST TO FIFTH AVE
PROFILE OF FOURTEENTH STREET FROM CANAL ST TO FIFTH AVE.
PROFILE OF SIXTEENTH STREET FROM BURLINGTON ST. TO FIFTH AVE.
PROFILE OF JACKSON STREET FROM CLINTON ST. TO FRANKLIN ST.
PROFILE OF VAN BUREN STREET FROM CLINTON ST TO FRANKLIN ST
PROFILE OF HARRISON STREET FROM CLINTON ST TO FIFTH AVENUE
PROFILES OF CANAL STREET
CHICAGO RIVER
CHICAGO CITY DATUM 0.0
NEW
CHANNEL
FIFTH AVE
EXTENSION
CAR STANDING CAPACITY
HOUSE TRACKS 61b
TEAM TRACKS 43b
COACH TRACKS 465
VIADUCT AND STREET LEVELS DEPENDENT UPON FUTURE DEVELOPMENT OF THIS AREA.
PRESENT
LA SALLE
PROFILE OF TRACKS
TERMINAL DEVELOPMENT PLANS
PLATE II A
HARRISON STREET SITE
RIVER STRAIGHTENED SOUTH OF HARRISON STREET
ACCOMPANYING REPORT OF
BION J. ARNOLD
ON
CHICAGO RAILROAD TERMINALS

PLATE II-A. WEST SIDE UNION STATION AT HARRISON STREET.

This alternative plan shows a double stub station located south of Harrison Street. All tracks in the Canal Street strip are depressed. The river is straightened from Harrison Street south, and Market and Franklin Streets are extended southward as "River Roads." Ample coach yards, team tracks and double deck freight houses are provided for. Many streets are opened and widened. Canal Street is double decked from Monroe Street to 15th Street. Rail and water connections are available on the west side and dock facilities on both sides of the new channel. Suburban tracks may either be placed between Canal Street and the main station tracks, at the main track level, or else at subway level, as in Plate III.



This alternative plan shows a double stub station located sou
Road." Ample coach yards, team tracks and two-level freight hous
stations are shown within the terminal area at both Harrison Street

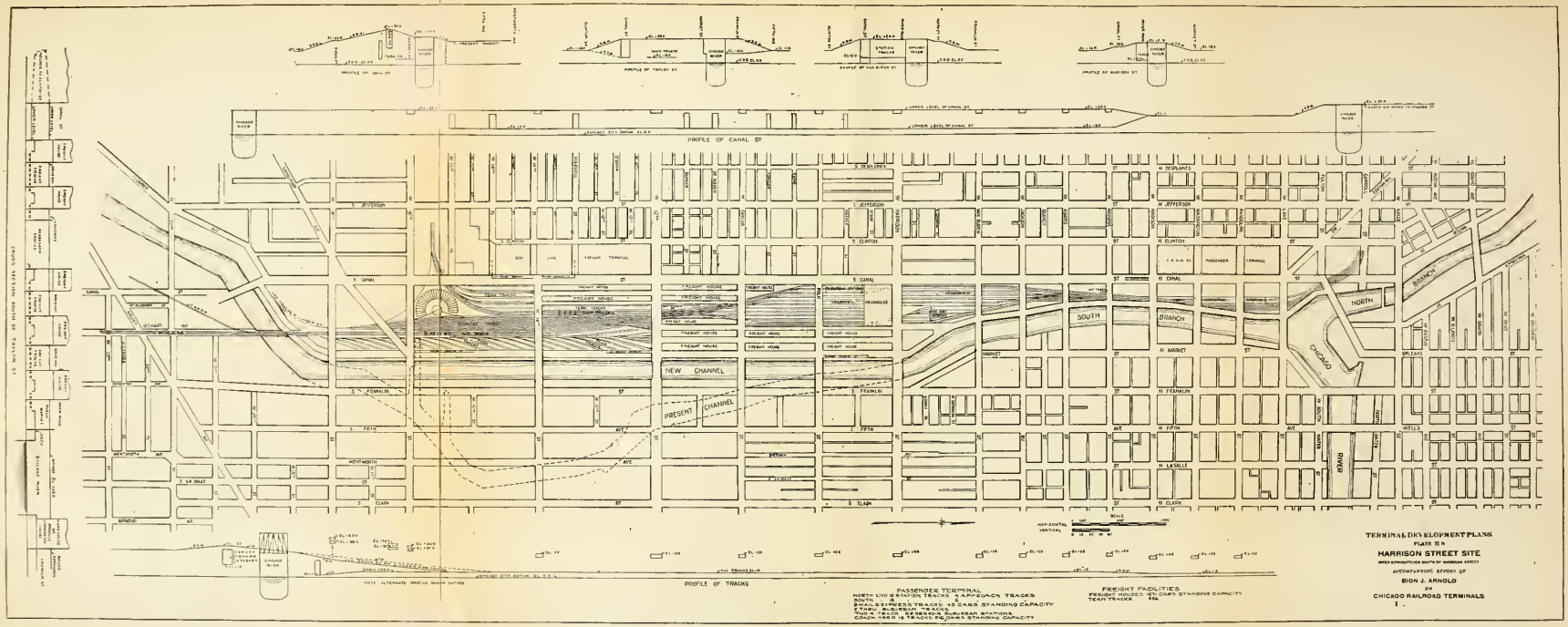
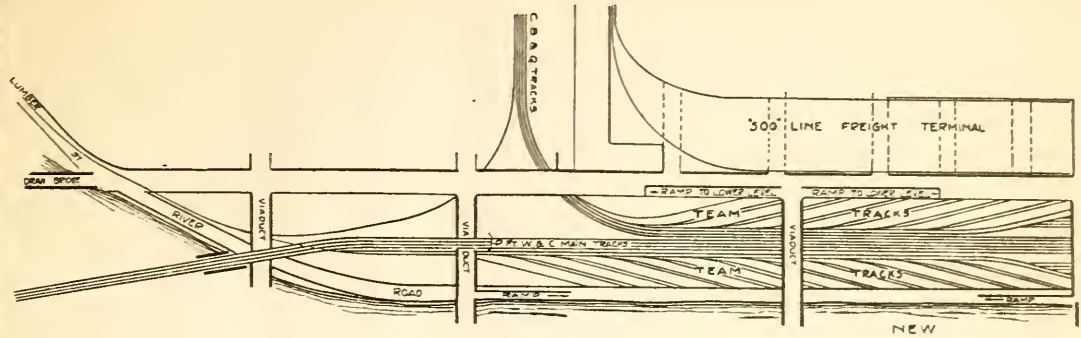


PLATE II-B. WEST SIDE UNION STATION AT HARRISON STREET.

This alternative plan shows a double stub station located south of Harrison Street. All tracks within the Canal Street strip are depressed. The river is straightened from Harrison Street south and Market Street is extended southward, joining Franklin Street, extended as a "River Road." Ample coach yards, team tracks and two-level freight houses are available in this plan. Many streets are opened and widened. Rail and water connections are provided for along the west bank and dock facilities along both banks of the straightened river. Reservoir suburban stations are shown within the terminal area at both Harrison Street and Washington Street, operated on the plan of a through routed suburban system.



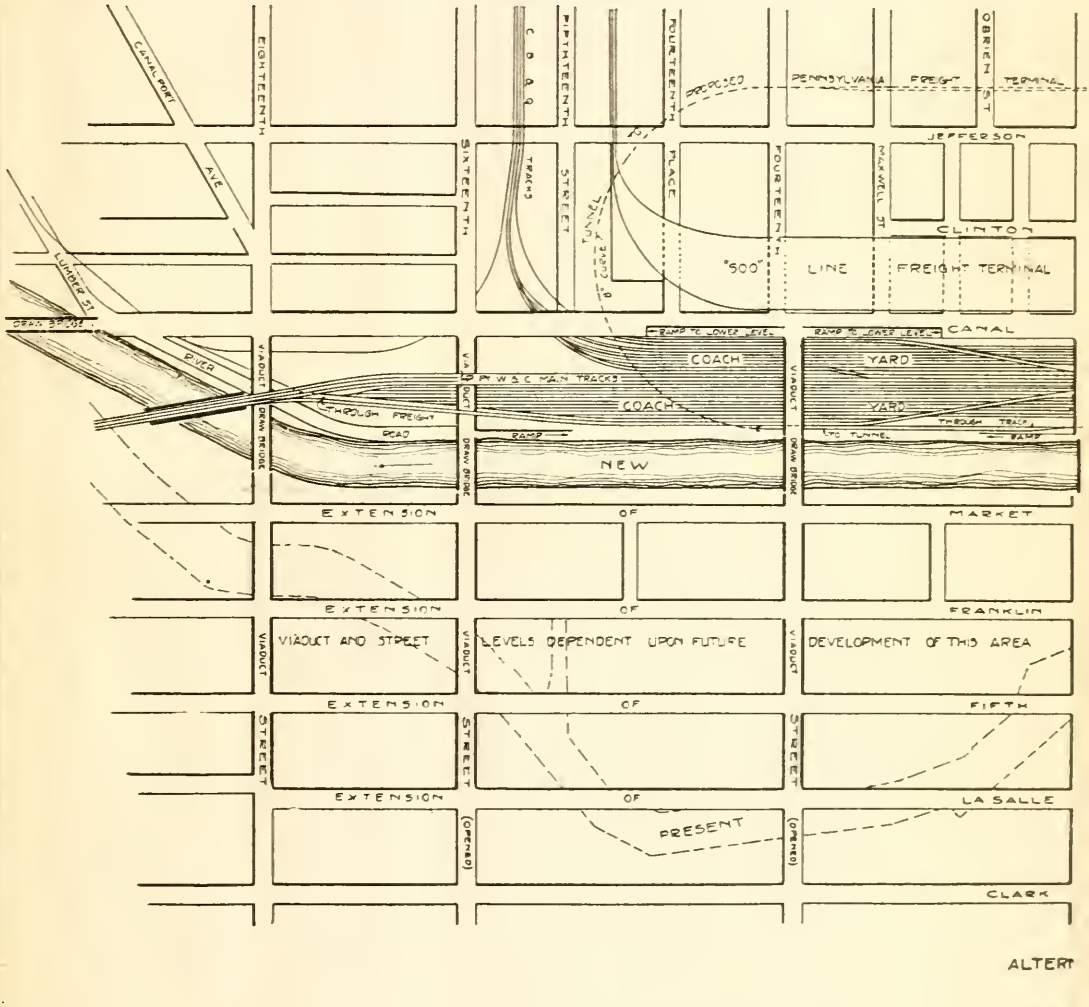


PLATE III. WES

This suggested plan shows a double stub station located at Adams and Canal roads only. The river is to be straightened from Van Buren Street south. Suburba opened and widened and a new River Road is added along the west bank of the river. other, coach yards, but no team tracks.

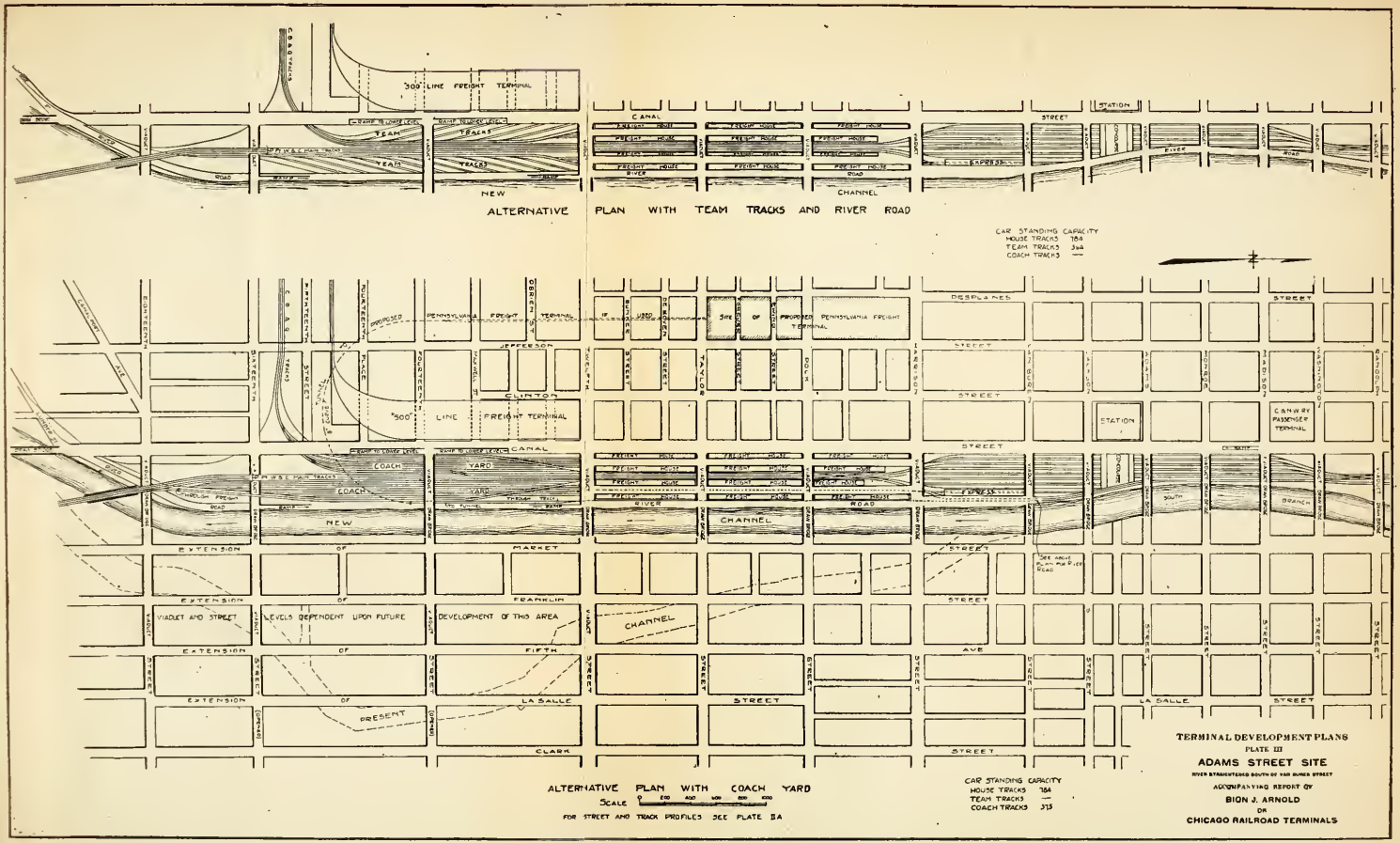


PLATE III. WEST SIDE UNION STATION AT ADAMS STREET.

This suggested plan shows a double stub station located at Adams and Canal Streets for the present use of the Union and Grand Central groups of roads, and the future use of western and northern roads only. The river is to be straightened from Van Buren Street south. Suburban service will ultimately be handled in a subway beneath the main tracks and next to the river. Many streets are opened and widened and a new River Road is added along the west bank of the river. Alternate plans are shown for yard development, in one case providing team tracks and no coach yards, and, in the other, coach yards, but no team tracks.

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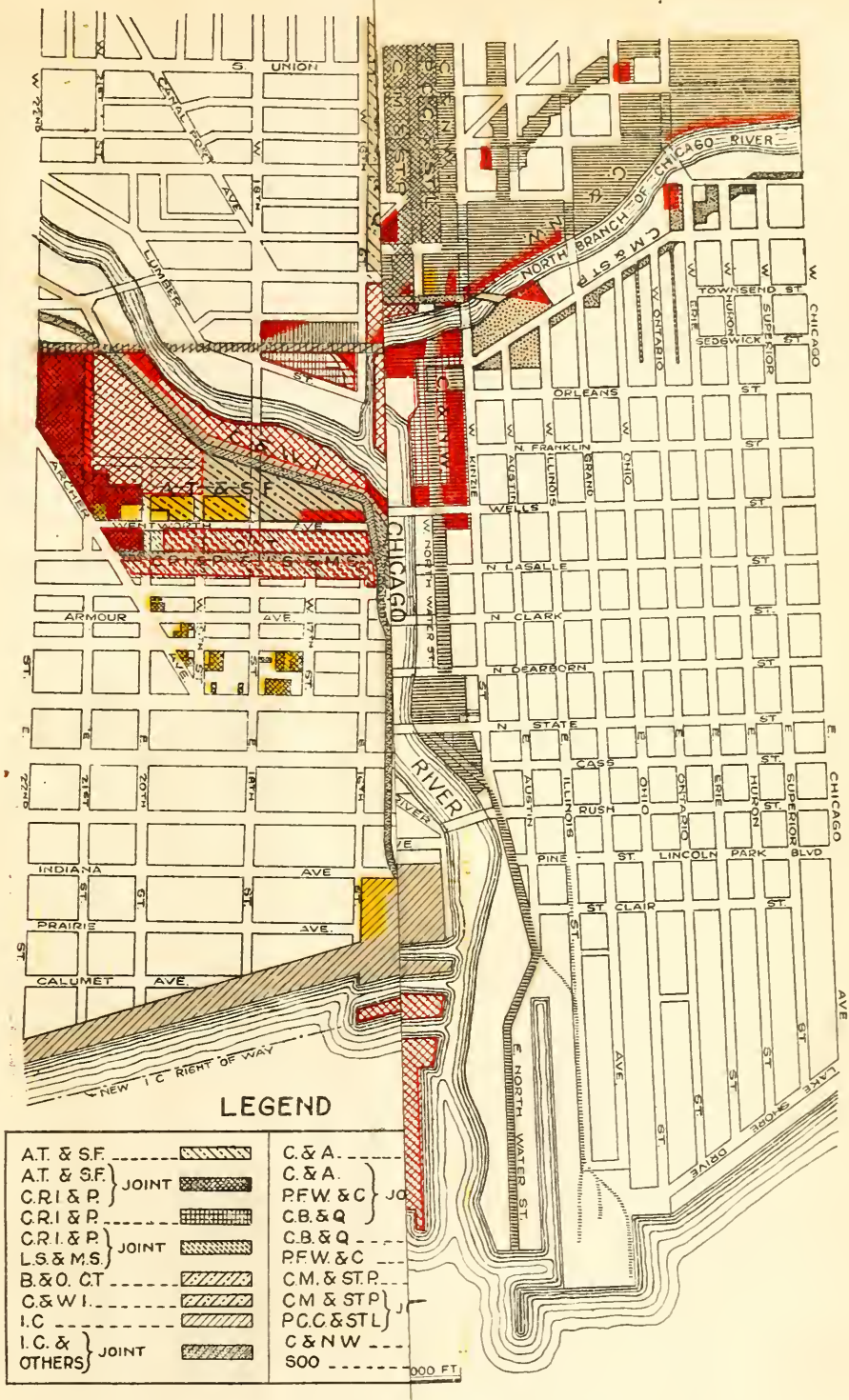

Showing the vast amount of se of much of the property. Due to the present method of taxing railroad practically tax free. This encourages the condition shown above, in wh yellow) are owned by the railroads, but privately occupied. The poss in eliminating congestion and opening avenues of growth for the business d

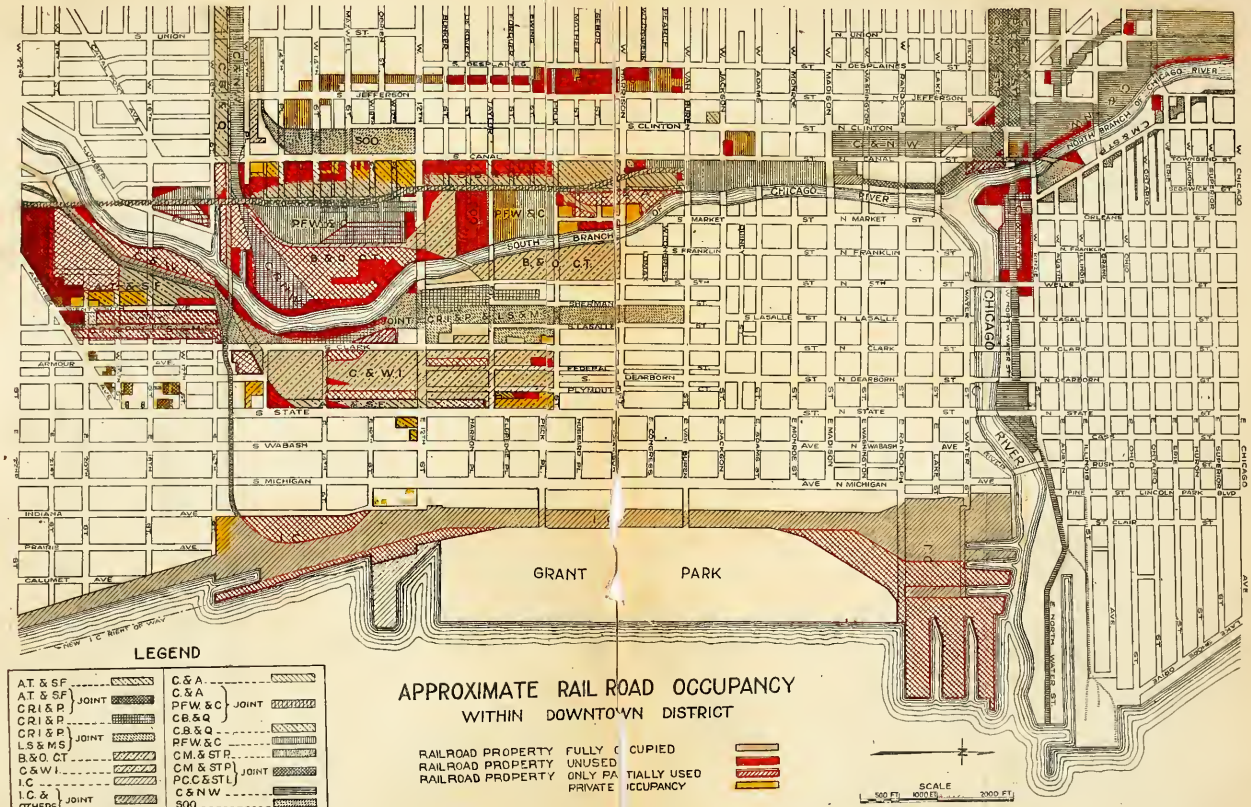

PLATE IV. PRESENT UTILIZATION OF RAILROAD PROPERTY.

Showing the vast amount of real estate owned by various railroad companies within the Chicago business district and the inefficient use of much of the property. Due to the present method of taxing railroad property on the basis of main line mileage, it is possible for railroads to hold large quantities of land practically tax free. This encourages the condition shown above, in which large areas (colored red) are practically unused for railroad operation, and other areas (colored yellow) are owned by the railroads, but privately occupied. The possibilities of more effective use of this railroad property through co-operation and intensive development, in eliminating congestion and opening avenues of growth for the business district, are evident.

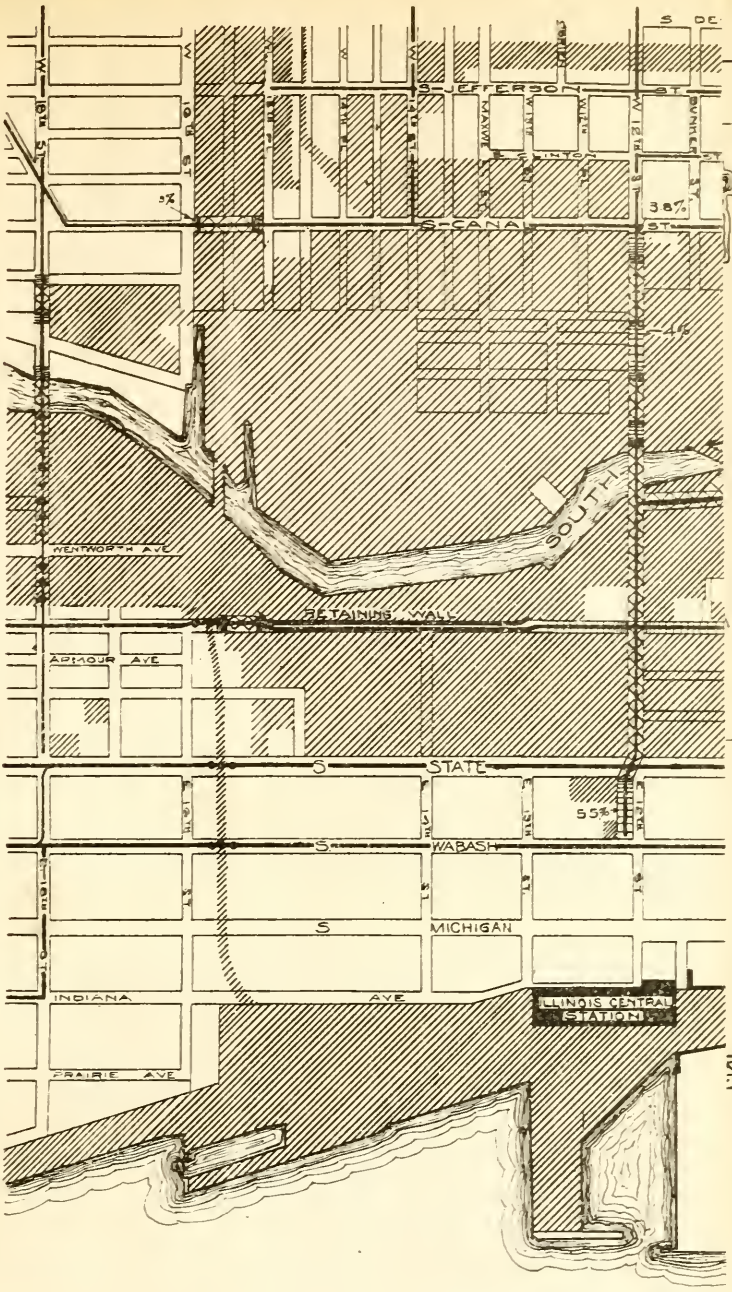

PLATE V. RELATION

Showing the area occupied by railroads in the down
he south, State, Wabash and Michigan Avenue alone are
viaduct approaches and in the vicinity of 14th Street by
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Toward the north, Jefferson, Clinton and Canal Streets all c
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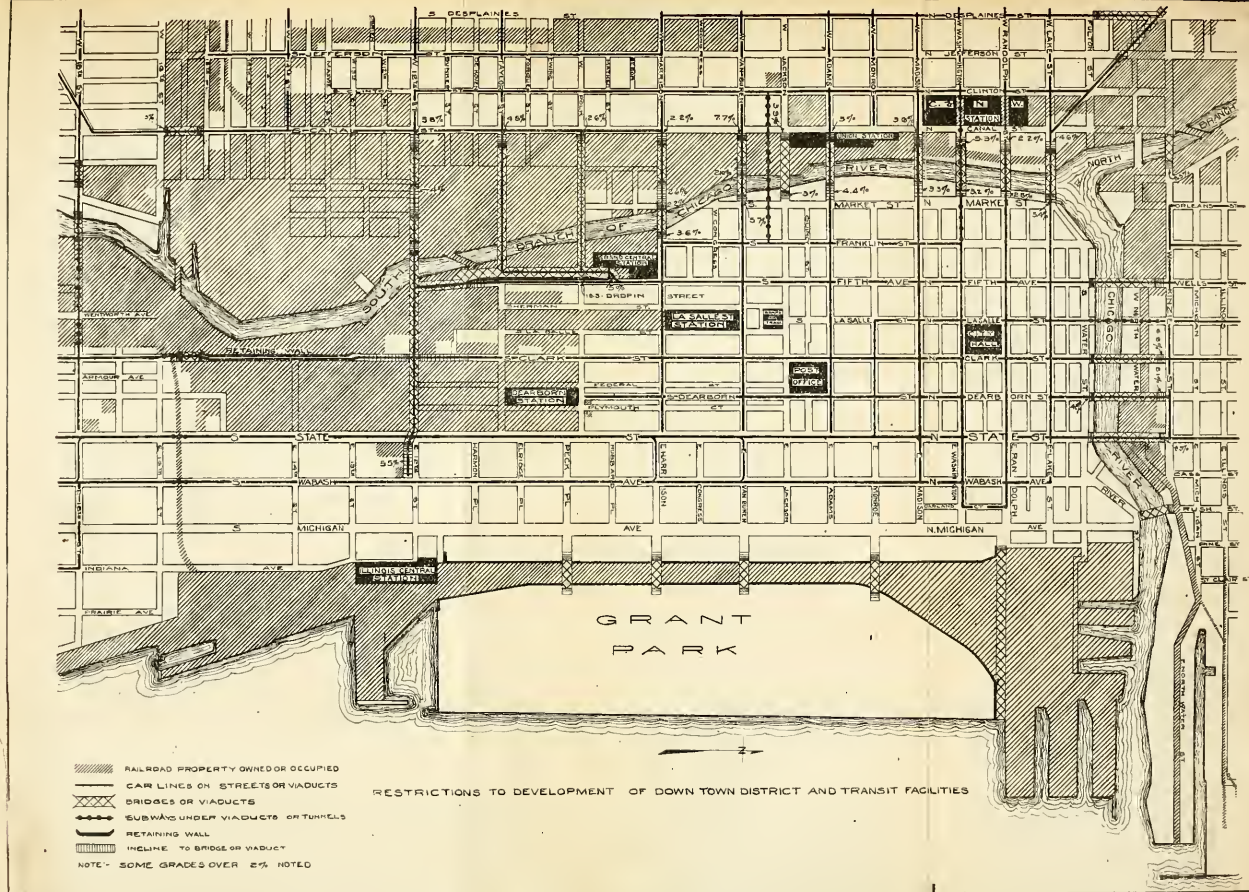
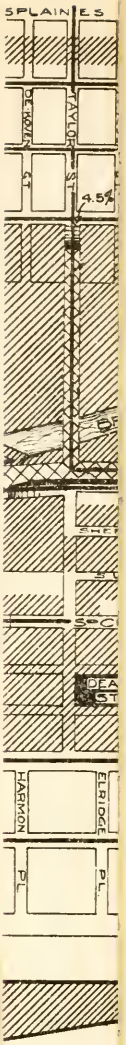


PLATE V. RELATION OF CONDITION OF THOROUGHFARES TO RAILROAD OCCUPANCY.

Showing the area occupied by railroads in the down town district and the effect upon conditions of thoroughfares. Of the streets entering the business district from the south, State, Wabash and Michigan Avenue alone are unobstructed. The only remaining street east of the river (Clark Street) is obstructed by artificial grades at viaduct approaches and in the vicinity of 14th Street by a retaining wall projecting into the street. West of the river, Canal Street provides practically the only unobstructed approach from the south. Jefferson Street crosses railroad tracks at grade in the vicinity of 16th Street, and Clinton Street is dead-ended at Maxwell Street. Toward the north, Jefferson, Clinton and Canal Streets all cross railroad tracks at grade. With the exception of two streets, there are no east and west thoroughfares crossing the railroad property south of Harrison Street, and these two, 12th and 18th Streets, are carried over railroad tracks on viaducts or under them in subways, so that their usefulness is much impaired. Polk and Taylor Streets are impassable as straight through thoroughfares, and neither can be used at all without ascending 4½ or 5 per cent grades at viaduct approaches. This condition causes a great volume of traffic to choose Harrison Street on account of its lower grade.



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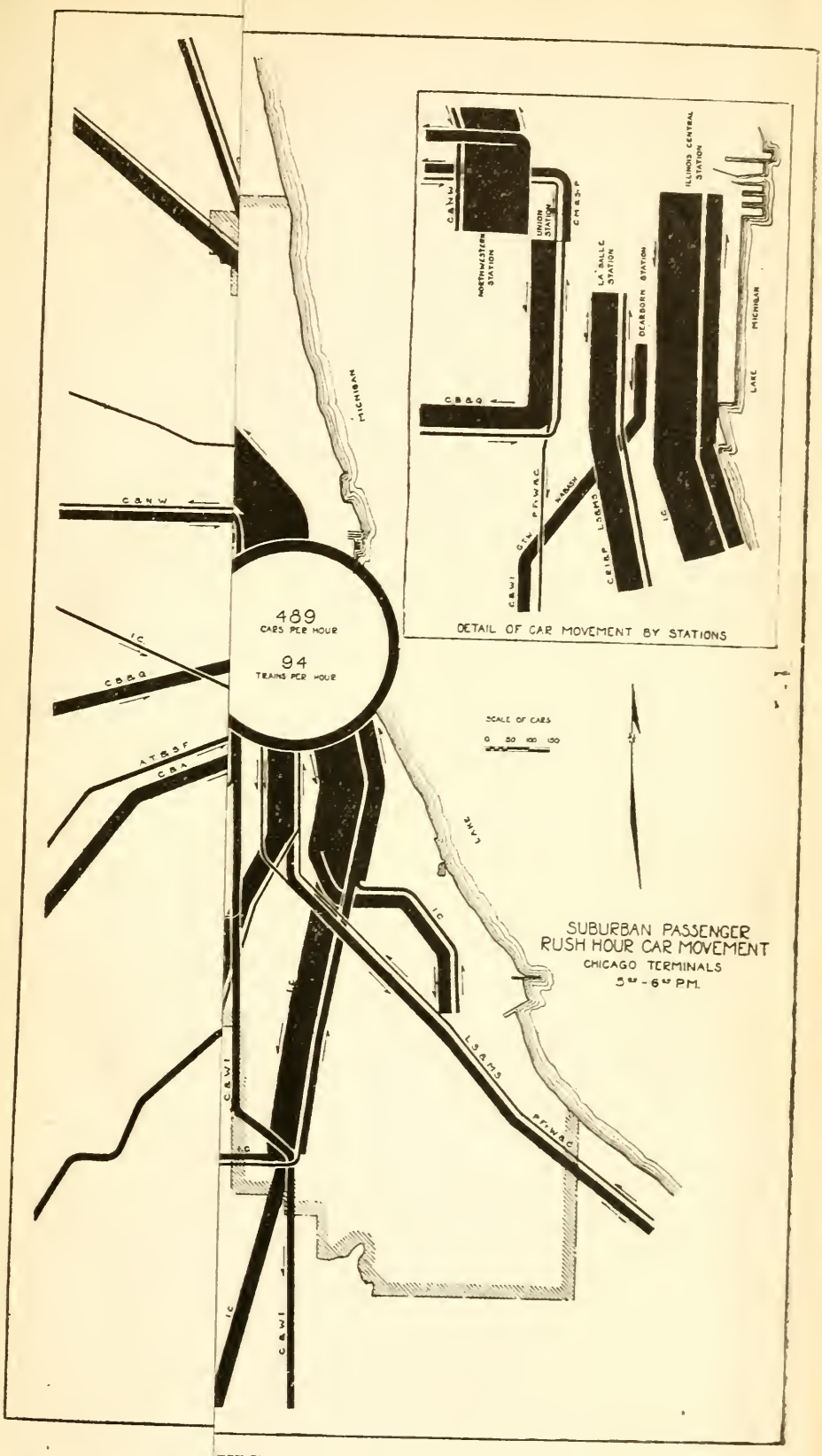

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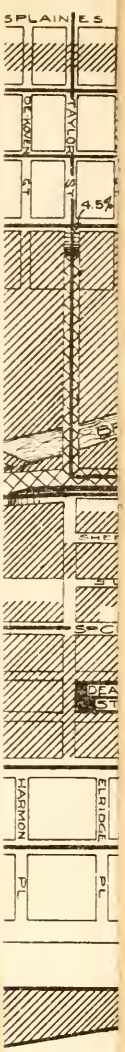
Indicat large proportion of suburban traffic carried by the North W service, makes the through routing of a considerable pro an passengers closer to their places of business, by running tr sioned by the present routing.



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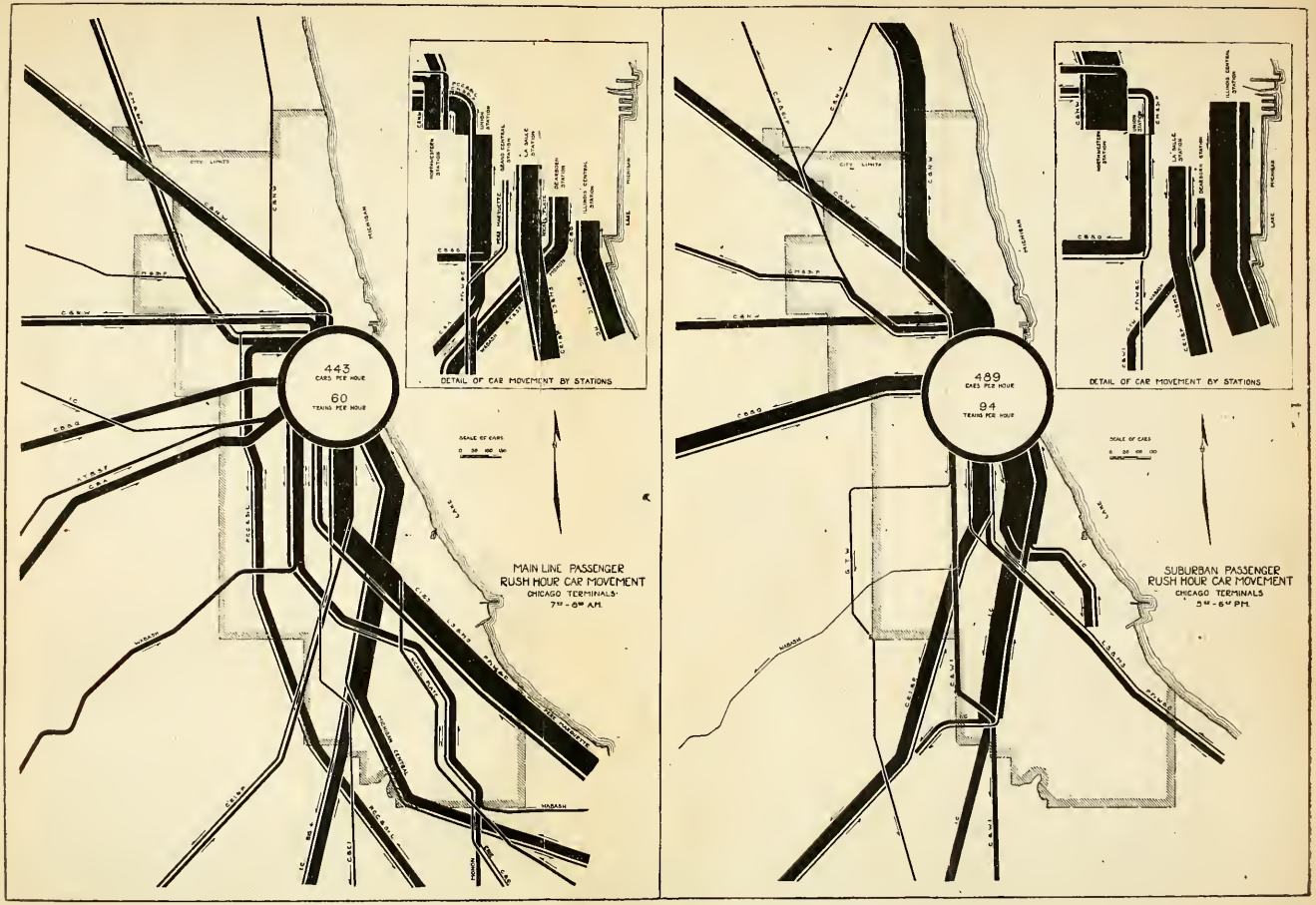
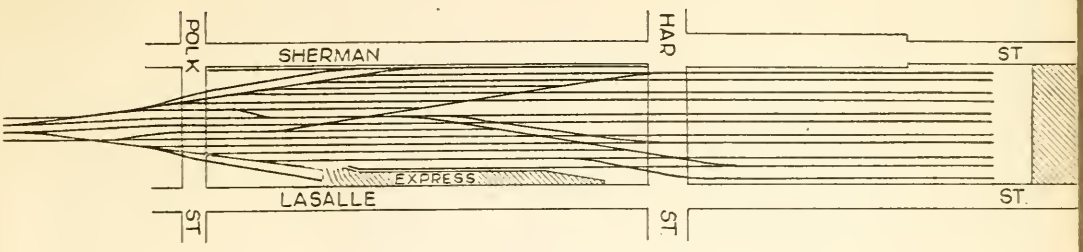


PLATE VI. TRAFFIC FLOW DIAGRAM—THROUGH AND SUBURBAN SERVICE.

Indicating the relative importance of the passenger traffic handled by various roads and stations during the rush hours. The large proportion of suburban traffic carried by the North Western and Illinois Central is apparent; it is also plainly seen that the unbalanced in-bound and out-bound suburban service, makes the through routing of a considerable proportion unnecessary. Great improvement can be made by interchange of coach yard facilities and by bringing suburban passengers closer to their places of business, by running trains through the down town district. The complexity of the diagram indicates the amount of crossing interference occasioned by the present routing.



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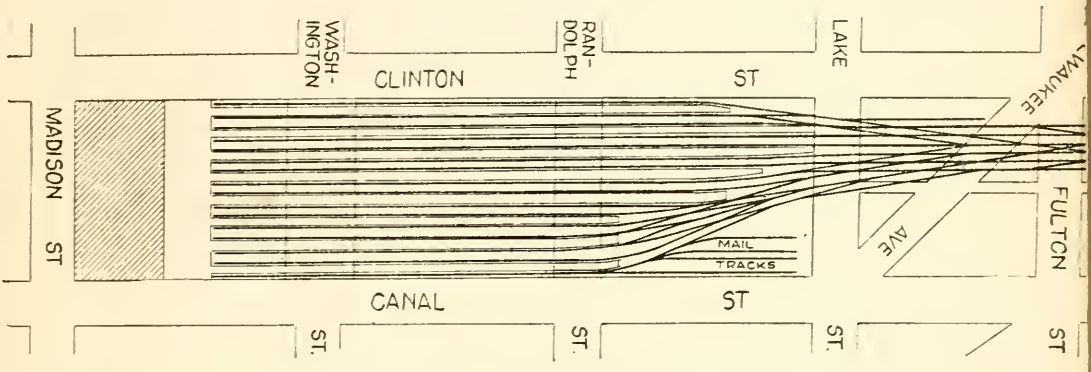
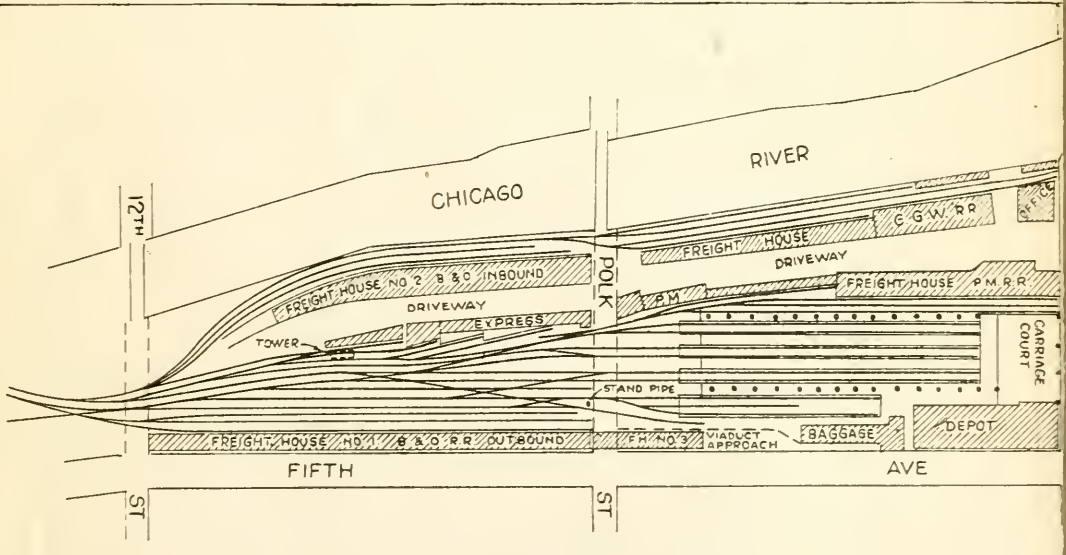


NORTH WESTERN STATION



GRAND CENTRAL DEPOT

PLATE VII. PRES

Diagrams showing the general arrangement of the six passenger stations now o capacity and must soon be replaced. The Chicago & North Western and La Salle S their traffic for some time to come. The Grand Central Station is the smallest in th

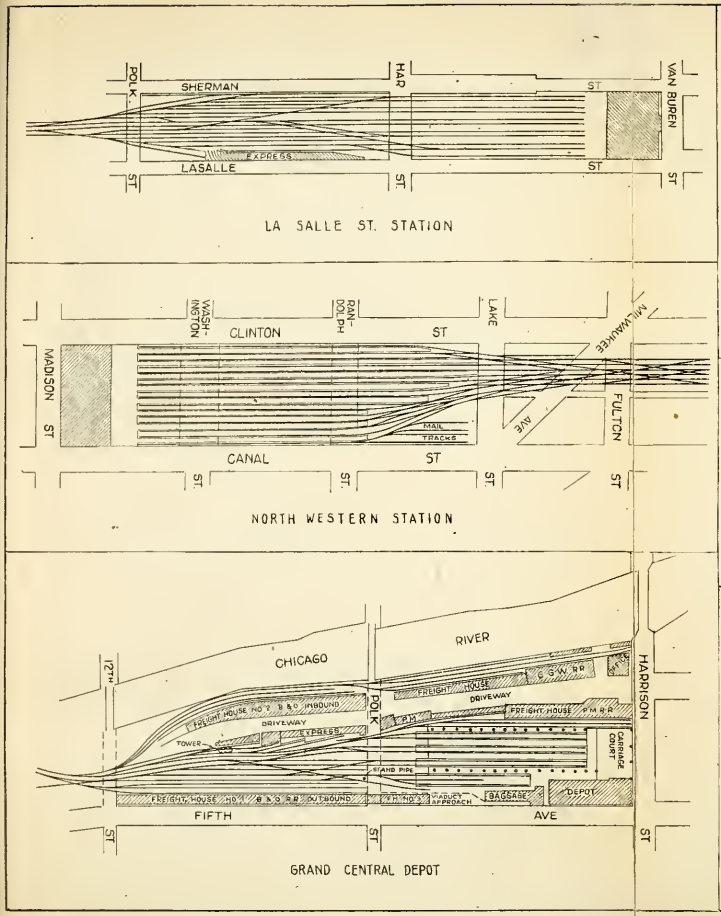


PLATE VII. PRESENT CHICAGO RAILROAD STATIONS.

Diagrams showing the general arrangement of the six passenger stations now operated in Chicago. Of these stations, the Illinois Central, Dearborn and Union Stations have reached their capacity and must soon be replaced. The Chicago & North Western and La Salle Street terminals are the most modern and best equipped stations in Chicago and have facilities to accommodate their traffic for some time to come. The Grand Central Station is the smallest in the city and handles little traffic.